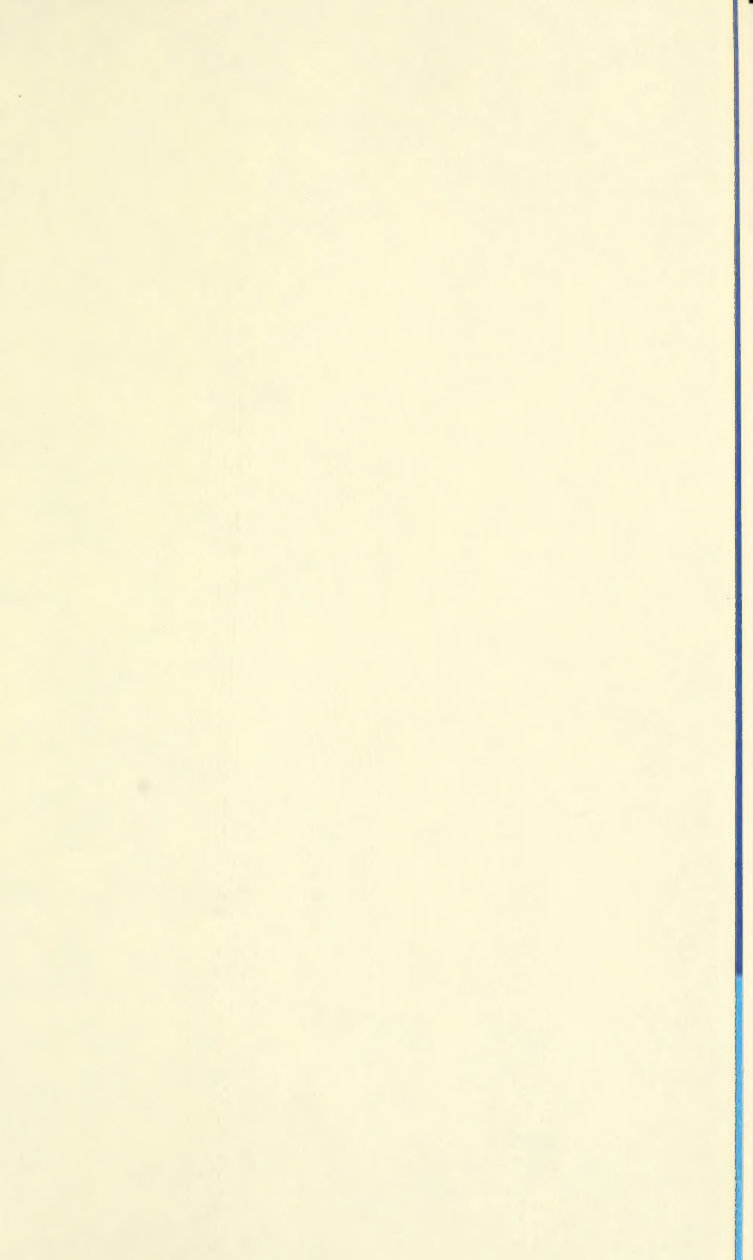


For Reference

Not to be taken from this room



Northeastern
University
1978-79

Boston-Bouvé College
Graduate School

23-964

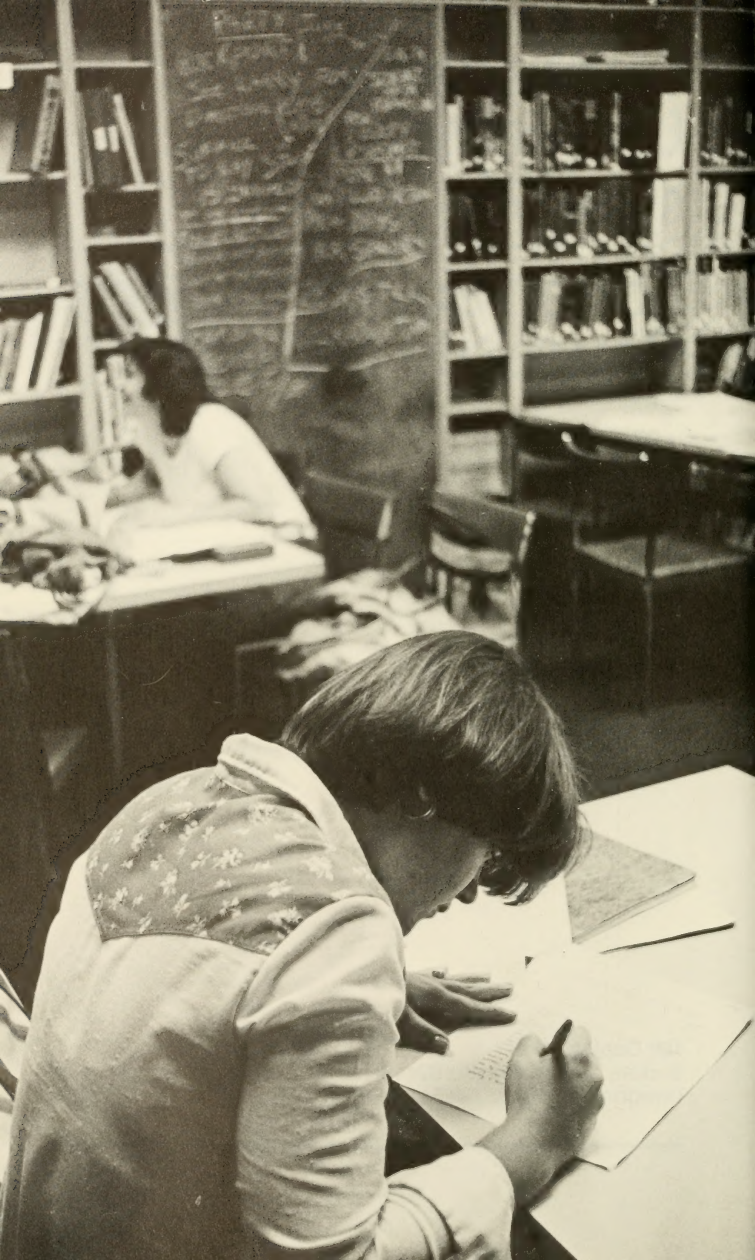
Northeastern University 1978-79

Boston-Bouvé College Graduate School



NEW ENGLAND
ASSOCIATION
OF SCHOOLS
AND COLLEGES
FOUNDED IN 1885

100 Dockser Hall
Boston, Massachusetts 02115
Telephone (617) 437-3154



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Academic and Service Buildings

African-American Institute
Barietta Natatorium
Botolph Building
Cabot Physical Education Center
Cahners Hall
Churchill Hall
Cushing Hall
Dana Research Center
Dockser Hall
Dodge Library
Eli Student Center
(Auditorium section)
Eli Student Center
(Student Lounge section)
Forsyth Building
Forsyth Building Annex
Greenleaf Building
Hayden Hall
Hillel House
Hurting Hall (Faculty Center)
Kerr Hall (Faculty Center)
Kerr Hall (Faculty Center)
(Grove Hall)
Knowles Center
(Volspe Hall)
11 Leon Street
15 Leon Street
Mugar Life Sciences Building (Peabody Health Professions Center)
Parker Building
Peabody Center
Richards Hall
Robinson Hall
Stearns Center
United Realty Building

Residence Facilities

Boston YMCA

115 Hemenway Street

119 Hemenway Street

153 Hemenway Street

157 Hemenway Street

163 Hemenway Street

Kerr Hall

Light Hall

Melvin Hall

Rubenstern Hall

106-122 St. Stephen Street

Smith Hall

Spaulding Hall

Stetson Hall East

Stetson Hall West

White Hall

Map Code

13
G6
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H11
B6
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J3
J3
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H10
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NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS

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STREET DIRECTION

PARKING

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ACADEMIC CALENDAR 1978—1979

Fall Quarter 1978

Registration period		
Burlington	Tuesday—Wednesday	Sept. 12—13
Boston	Monday—Thursday	Sept. 18—21
Classes begin	Monday	Sept. 25
Last day to drop a course	Wednesday	Nov. 22
Examination period	Monday—Saturday	Dec. 11—16

Winter Quarter 1978—79

Registration period		
Burlington	Tuesday	Nov. 28
Boston	Monday—Thursday	Dec. 4—7
Classes begin	Tuesday	Jan. 2
Last day to drop a course	Friday	Mar. 2
Examination period	Monday—Saturday	Mar. 19—24

Spring Quarter 1979

Registration period		
Burlington	Tuesday	Mar. 6
Boston	Monday—Thursday	Mar. 12—15
Classes begin	Monday	Apr. 2
Last day to file card for Spring Commencement	Friday	Mar. 30
Last day to pay fee for Spring Commencement	Tuesday	May 1
Last day to drop a course	Friday	June 1
Examination period	Monday—Saturday	June 11—16
Spring Commencement	Sunday	June 17

Summer Quarter 1979

Registration period		
Burlington	Monday—Tuesday	June 11—12
Boston	Wednesday—Thursday	June 13—14
Classes begin	Monday	June 25
Last day to file card for Fall Commencement	Friday	July 6
Last day to pay fee for Fall Commencement	Wednesday	Aug. 1
Examination period	Wednesday—Thursday	Aug. 1—2

UNIVERSITY HOLIDAYS 1978—79

Columbus Day	Monday	October 9
Veterans Day	Saturday	November 11
Thanksgiving Recess	Thursday—Saturday	November 23—25
Christmas Vacation	Monday—Monday	Dec. 18—Jan. 1
Martin Luther King Day	Monday	January 15
Washington's Birthday	Monday	February 19
Patriot's Day	Monday	April 16
Memorial Day	Monday	May 28
Independence Day	Wednesday	July 4
Labor Day	Monday	September 3

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer and/or the Title IX coordinator.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. Radio stations WBZ, WEEI, WHDH, WJDA, WCOP, WRKO, WLYN, WKOX, WHAV, and WLLH will announce the University's decision to close.

In addition, the University maintains an emergency snow phone (262-SNOW). Whenever in doubt, call 262-SNOW and a taped message will indicate the status of classes.

The Northeastern University catalog contains *current information* regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

We at Northeastern will do our best to make available to you the finest education we can provide, the most stimulating atmosphere in which to learn, and the most congenial conditions under which you may enjoy the learning experience. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. You will be a full participant in an educational partnership. We will and, indeed, can only make the opportunities available to you; it is up to you to take advantage of them.

This is equally true with your career upon graduation. We cannot guarantee that you will obtain any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state. While we will be ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because we cannot know what your expectations and understandings are unless you tell us.

In brief, what we are saying to you is that we are here to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.



the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of nearly 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not attempted to duplicate the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method offers students the opportunity to gain valuable practical experience as an integral part of their college program and often provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor's degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouv  College offers the degree of Master of Science with specializations in Physical Education and Recreation and Leisure Studies.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degrees of Master of Education and Doctor of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineering, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intra-state lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 50 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, and Health Education, Physical Education, Recreation and Leisure Studies, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 412,000 volumes supplemented by some 452,300 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 4,000 periodical titles, 100,000 documents, and 10,000 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouv  College.

The Barletta Natatorium houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, the main Boston-Bouv  College building, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, darkroom, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouv  College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, pro-

fessional, and research groups. Henderson House is located 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is located about 20 miles northeast of Boston. Many of the courses at this Institute are applicable toward an advanced degree in biology or health science.

Government Center Campus

With the cooperation of the Federal Executive Board, the Graduate School of Liberal Arts, Department of Political Science, offers an entire Master of Public Administration program at the John F. Kennedy Building in downtown Boston. This program is primarily for individuals employed in federal, state, or local civil services.



boston-bouvé college graduate school

The purposes of advanced study in Boston-Bouvé College are consistent with the philosophy of Northeastern University, and with the goals of advanced study in the professions. The programs are designed to fulfill the needs and interests of personnel in physical and recreation education in an era of social and educational change and redirection.

The goals of graduate education in Boston-Bouvé College are:

1. To provide the opportunity for advanced preparation for administrators, supervisors, teachers, recreation specialists, coaches, and researchers through specific professional study and interdisciplinary experience.
2. To aid in the development of appreciation for the orderly approach to discovery through research, philosophical thought, and discussion.
3. To assist in providing a sound basis for research and in facilitating student research experiences and applications.
4. To contribute to the development of leaders and teachers capable of designing current and innovative approaches to learning and curriculum development.
5. To provide the opportunity for intensive study in a specialized area of concern, with awareness of problems in education and society.
6. To provide a foundation for advanced study at the doctoral level.

PART-TIME STUDY

Graduate programs in Boston-Bouvé College are structured to provide an opportunity for the master's degree candidate to attend classes in the late afternoon or evening while continuing his/her full-time employment. By judicious use of electives and independent study, a student may carry the equivalent of a full-time course load in Recreation and Leisure Studies.

Students normally take one or two courses per quarter and can complete the degree program in two to three years, depending upon whether or not course work is taken during the summer quarter.

Students maintaining a satisfactory academic standing may petition the Director of the Graduate School for permission to take more than two courses per quarter.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council.

In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the Council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Application

All applicants should address inquiries to Boston-Bouvé College Graduate School. Application forms and information will be mailed promptly.

Registration

Students must register within the period listed on the school calendar. Time and place of registration will be announced prior to each period.

Residence

All work for advanced degrees must be completed in residence at the University, unless approval has been obtained from the Director of the Boston-Bouvé College Graduate School for work taken elsewhere. Students who are in residence and using the facilities of the University must register for such work.

Student Visas

Foreign students on student visas must study on a full-time basis. There is a full-time program available with advisement in the Recreation and Leisure Studies curriculum. *There is no full-time program in Physical Education at this time.*

Grading System

The performance of students in graduate courses is recorded by the instructor, using the following grades:

- A Excellent
For performance of high graduate caliber
- B Satisfactory
For performance at a satisfactory level
- C Fair
For performance not at the level expected in graduate work
- F Failure
For unsatisfactory performance

In addition, the following letter designations are used:

- I Incomplete
For failure to complete course work
- S Satisfactory without quality designation
For satisfactory completion of course work
- U Unsatisfactory without quality designation

The grades S and U are used for the first quarter of a two-quarter sequence in which the second-quarter grade applies to both the first and second quarters of the sequence: e.g., Thesis I and II.

The designation I is to be changed to a grade upon removal of the deficiencies which caused the I to be reported. Deficiencies must be removed within the quarter following that for which the I is received, unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters. Grades of Incomplete received in Thesis I and II may be continued beyond the two-quarter limit, but must be removed prior to graduation and within the six-year time limitation.

Class Hours and Credits

All credits at Northeastern University are entered as quarter-hour credits, with a quarter hour of credit being equivalent to three-fourths of a semester hour, i.e., 12 semester hours are equal to 16 quarter hours.

All classes in the Boston-Bouvé College Graduate School meet on a quarter basis, with an academic quarter defined as a term of approximately 12 weeks' duration. In the summer quarter, classes meet in a term of six weeks' duration. The academic calendar in the front of this bulletin should be consulted to determine the opening dates of each quarter.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Burlington Campus. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they complete the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal. Petitions for withdrawal from a course after the ninth class meeting of the quarter must be submitted to the Director of the Graduate School, and may be approved to avert unusual hardships on the student.

Students who do not attend the first two sessions will be dropped from the class unless they notify the Registrar of their intention not to withdraw.

Changes in Requirements

The continuing development of the Graduate School forces frequent revision of curricula. In every new bulletin, some improvements are indicated.

When changes impose no hardship on the student and school facilities permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Application for the Diploma

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed on the calendar, there is no assurance that the degree will be granted in that particular year, even though all other requirements have been fulfilled.

THE MASTER OF SCIENCE DEGREE

Admission to Degree Candidacy

For admission to the Boston-Bouvé College Graduate School, a degree candidate must have presented the following to the Director of the Graduate School:

1. A completed application and \$15 application fee.
2. Official transcript(s) from accredited institution(s) as evidence of successful completion of the baccalaureate degree. The transcript(s) should show a cumulative average of 2.5 or better and a minimum of 18 semester hours or 24 quarter hours of work in specified courses in the student's proposed major or the equivalent in professional background.
3. Record of an interview with the Director of the Boston-Bouvé College Graduate School or designee — required only if candidate has an undergraduate degree unrelated to the area of specialization or has less than a 2.5 cumulative average.
4. Three references from persons familiar with the applicant's professional, academic, and character background.
5. An official record of the Miller Analogies Test score.

It is recommended that all materials be on file in the office of Boston-Bouvé College Graduate School before registration for the first graduate course. In no case will a conference and course registration be permitted without a minimum of a completed application and a copy of the undergraduate transcript. The additional materials — the Miller Analogies Test score and references — *must* be received no later than the end of the first quarter. A student may not continue in the program unless these conditions are fulfilled.

Academic Classifications

Students whose materials meet the criteria above are classified as regular students.

The Director of Boston-Bouvé College Graduate School may admit any person as a special student who presents evidence of a bachelor's degree

and who appears otherwise prepared to undertake study in the Graduate School. Admission is on the provision that the applicant: a) files an application, and b) acknowledges that if he/she subsequently wishes to be reclassified as a degree candidate, only 12 quarter hours of academic credit earned as a special student may be applied toward a degree.

Academic Requirements

A candidate for the master's degree must complete an approved program conforming to requirements of the department in which the candidate is registered. At the discretion of the Graduate Committee, any student whose record is not satisfactory may be dropped from the program. A minimum of 48 quarter hours of correlated, graduate-caliber work, along with other study required by the department, must be completed.

An average grade of at least B must be obtained in the quarter hours of credit required for the degree, excluding any transfer credits. Not more than eight quarter hours of extra or repeated courses are allowed to satisfy grade requirements for the degree.

Within the above limitations, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be submitted. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

A degree candidate's record is subject to review by the Boston-Bouvé College Graduate Committee upon completion of his/her sixth course at Northeastern University. At this time, the student must have made reasonable progress in achieving his/her program objectives, and have obtained at least a B average. If the requirements are met, he/she is encouraged to continue the program. In the event his/her record is unsatisfactory, he/she may be dropped as a degree candidate from the Boston-Bouvé College Graduate School.

Program Selection

Upon acceptance as a degree candidate, the student is assigned to a program adviser in his/her major area of concentration. In consultation with his/her adviser, the student develops a program of study, including program objectives, anticipated courses, and estimated dates for completion of the various degree requirements. Prior to completion of the first 12 quarter hours of credit, the program requires approval by the Boston-Bouvé College Graduate Committee. Any subsequent changes in program require further Committee approval.

Transfer Credits

A maximum of 12 quarter hours of credit obtained at another institution is accepted toward the master's degree, provided that the credits are recommended for transfer by the student's program adviser; consist of

work taken at the graduate level for graduate credit; carry grades of A or B; have been earned at a recognized institution; and have not been used toward any other degree. Students should petition the Director of the Graduate School, in writing, for all transfer credit, completing the necessary form obtainable from either the office of Boston-Bouvé College or the faculty program adviser. This form should be submitted to the student's program adviser along with an official transcript and a course description. Grades on transfer credits may not be used in obtaining the academic average necessary for completion of degree requirements.

Time Limitations

Course credits earned in the graduate study program or accepted by transfer are valid for a maximum of six years from the date of course completion unless an extension is granted by the College Graduate Committee.

Comprehensive Examination

A comprehensive subject-matter examination is taken by each candidate no later than two weeks before his commencement. This examination may be taken when the candidate has completed at least three-fourths of the designated course work, and received consent of his program adviser. The comprehensive examination is prepared by selected graduate faculty with whom the student has studied. The areas to be tested are commensurate with the student's specialization, area of concentration, and core subject matter appropriate to his professional field. The program adviser makes arrangements for the preparation of the test. Faculty members preparing the examination assume responsibility for its reading and grading, and for informing the adviser of results. Test results are reported by the program adviser to the Director of the Boston-Bouvé College Graduate School.

Each section of the examination is graded on the basis of A, B, C, or F. To pass, the candidate's total grade must average to the grade of B. Grades of F are not acceptable. A student failing all or part of the examination may, upon the recommendation of his adviser, be given one reexamination. Conditions governing reexamination are determined by the Director of the Graduate School or an appropriate designee.

Thesis/Project

Each candidate must submit a thesis or project which clearly exhibits his/her research ability, and is designed to increase the scope of his/her individual specialization. The proposal is submitted to the program adviser. Upon initial approval of the proposal, an adviser and two additional committee members are appointed by the Director of the Graduate School at the recommendation of the program adviser. The thesis or project proposal must be approved by the thesis/project committee and the Director of the Graduate School.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates and fees are subject to revision by the Board of Trustees at any time. However, any change in tuition and fees will become effective at the beginning of the school year which follows the one in which the change was announced. Tuition for master's degree candidates and special students is \$65 per quarter hour of credit.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University on or before the date specified.

Fees

All applications must be accompanied by a nonrefundable application fee of \$15. No application will be processed until the fee has been received by the Graduate School of Boston-Bouvé College. Checks should be made payable to Northeastern University and sent, with the application, to Director of Graduate School, 100 Dockser Hall.

Other fees include a charge of \$10 for late payment of tuition; a fee of \$2 for deferred tuition (with approval of Bursar); and a fee of \$25 for all degree candidates, payable four weeks before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the student center. The fee for teaching assistants and research fellows is \$6.25 each quarter. All part-time students on the Huntington Avenue campus are charged \$.75 a quarter.

All full-time students, including those with assistantships and fellowships, will pay a nonrefundable University health services fee of \$140 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the student to the medical care furnished by the University Health Service.

All financial obligations to the University must be discharged by graduation.

Refunds

Tuition refunds are granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Official Withdrawal Filed Within:	Percentage of Tuition Refunded:
First week of quarter	100
Second week	75
Third week	50
Fourth week	25

FINANCIAL AID

There is a limited amount of financial aid for part-time students enrolled in Boston-Bouvé College Graduate School. Graduate assistantships and/or fellowships in the College are not available to part-time students. There are a limited number of teaching assistantships available to qualified full-time graduate students. Assigned duties require 18-20 hours per week for which the student receives a \$3,000 stipend and tuition waiver. Further information and applications may be obtained from the Boston-Bouvé College Graduate Office.

The Office of Financial Aid offers several types of assistance to graduate students. All awards are based on financial need. Since the majority of these awards are sponsored by the federal government, the amount of aid granted is dependent upon the amount of funds allocated to Northeastern University each year.

Only students who have been officially accepted as degree candidates may apply for financial aid. In addition, the University only awards financial aid to students who are U.S. citizens and permanent residents of the United States. Students who are studying in the United States on student visas are not eligible for federal assistance.

Northeastern University is a participant in the Graduate and Professional School Financial Aid Service (GAPSFAS). All applicants must file a GAPSFAS in order to be considered for financial aid. All sections of the GAPSFAS, including the parents' section, must be completed and sent to GAPSFAS, Box 2614, Princeton, New Jersey 08540. Northeastern University also requires a Graduate Student Application. These forms may be obtained in the Office of Financial Aid, 254 Richards Hall.

The following types of assistance are administered by the Office of Financial Aid:

National Direct Student Loan

This program is available to full-time graduate students who *need* a loan to meet their educational costs. Graduate students may borrow up to \$10,000 under this program. Repayment and interest do not begin until nine months after the student ceases to carry at least a half-time academic load at any institution of higher education. Repayment may be extended over a ten-year period with an interest rate of three percent per annum. No payments are required for up to three years while a borrower is serving in the Armed Forces, Peace Corps, or VISTA. Cancellation provisions are available for borrowers who work in certain fields of teaching or specified military duty.

College Work-Study Program

This program is available to full-time graduate students who have financial need. It is designed to give students an opportunity to earn as much as \$3.75 per hour working in jobs on or off campus in public or private non-

profit organizations. This program is administered solely by the Office of Financial Aid and should not be confused with the University's Cooperative Education Program.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least *one-half* the normal academic load, may borrow from a participating bank or other financial institution. Terms and conditions of these loans vary from state to state. New federal regulations affecting this program were signed into law on October 12, 1976 (S.2657). In some states, full-time graduate students may borrow up to \$5,000 per academic year. Loan recommendations are based on financial need. Students eligible for federal interest benefits are not subject to interest payments until nine months after they cease to carry at least a half-time academic load. Repayment may be extended for as long as ten years with an interest rate of seven per cent per annum. No payments are required for up to three years while a borrower is serving in the Armed Forces, Peace Corps, or VISTA. Information and applications are available from banks, state guarantee agencies, and regional offices of the U.S. Office of Education. Massachusetts residents may contact the Office of Financial Aid for the necessary applications.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr., awards are made as openings occur to a limited number of qualified minority graduate students who show financial need and are accepted to full-time study in the graduate schools of the University. Stipends can cover tuition and fees. Applications for Martin Luther King Scholarships are available at the African-American Institute, 40 Leon Street, 437-3141.

Acceptance Conditions

Northeastern University, which is a member of the Council of Graduate Schools of the United States, subscribes to the following resolution of the Council:

Acceptance of an offer of financial aid (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by an actual or prospective graduate student completes an agreement which both student and graduate school expect to honor. In those instances in which the student accepts the offer before April 15 and subsequently desires to withdraw, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer.



fields of study

PROGRAMS IN PROFESSIONAL SPECIALIZATIONS

Master of Science

Description

All students must complete one of the programs as outlined in the following pages. In almost all cases the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the student's program adviser and approval of the Boston-Bouvé College Graduate School Director.

Core Courses Required of All Candidates

- 10.9H7 Applied Statistics
- 66.802 Research Design and Methodology
- 66.890 Thesis/Project I
- 66.891 Thesis/Project II

Competency, as demonstrated by the successful completion of proficiency examination, is accepted in lieu of Statistics and/or Research Design. The candidate must petition the Director of Boston-Bouvé College Graduate School for permission to attempt the proficiency examination. An elective course must be substituted for a core course which has been waived.

Specialization in Physical Education

For a specialization in Physical Education, 20 quarter hours of departmental courses are required. Eight quarter hours are selected from foundation courses taken within Boston-Bouvé College and 12 quarter hours from one of the five areas of concentration. In addition, 12 quarter hours of free elective courses appropriate to the student's program are selected from within Boston-Bouvé College or from other Colleges at Northeastern University. Foundation electives, areas of concentration, and the courses therein follow.

Foundation Electives within Boston-Bouvé College

- 62.870 Philosophies in Physical Education
- 62.872 Comparative Physical Education
- 66.874 Seminar in Issues and Trends in Health and Physical Education
- 66.886 Critical Thinking in Health, Physical Education and Recreation
- 66.899 Seminar/Workshop
- 66.901 Health Issues: Implications for Education
- 66.904 Contemporary World Health
- 66.905 Environmental Health
- 66.906 Consumer Health

Areas of Concentration

Area I — Administration and Supervision

- 62.810 Administration of Physical Education and Athletics
- 66.814 Supervision of Professional Personnel
- 62.822 Problems in Contemporary Athletics for Men and Women
- 66.805 Planning and Developing Facilities for Physical Education and Recreation

Area II — Curriculum and Instruction

- 62.830 Curriculum Development in Physical Education
- 62.833 Applied Evaluation in Curriculum and Instruction
- 62.835 Seminar in Curriculum and Instruction
- 62.840 Advances in Instructional Concepts
- 62.842 Physical Education for Students with Special Needs
- 62.884 Movement and the Learning Process

Area III — Development and Learning in Movement and Perception

- 62.842 Physical Education for Students with Special Needs
- 62.860 Early Childhood Movement Patterns
- 62.864 Perceptual Motor Development
- 62.884 Movement and the Learning Process
- 66.894 Independent Study
- Selected Interdisciplinary Courses or Movement Education Laboratory

Area IV — Sports Sciences

- 62.851 Anatomic Kinesiology
- 62.852 Mechanical Analysis of Sport
- 62.854 Physical Fitness Appraisal and Guidance
- 62.857 Trauma Diagnosis and Treatment in Sport
- 62.859 Rehabilitation from Injury in Sport
- 62.880 Sociology of Sport
- 62.882 Psychology of Coaching and Sport

Specialization in Recreation and Leisure Studies

To specialize in Recreation and Leisure Studies, four quarter hours of departmental course work are required. Each candidate is registered for either 63.812, Seminar in Contemporary Issues and Problems in Recreation Services or 63.830, Advanced Organization and Administration of Recreation Services. In addition, seven courses (28 quarter hours) appropriate to the student's needs and professional objectives are selected from the following list:

Community Recreation

- 63.805 Program Evaluation in Recreation
- 63.834 Programs in Recreation
- 63.840 Politics and Bureaucracy in Recreation
- 63.842 Recreation and the Community School — Concepts and Practices
- 63.844 Leisure and Delinquent Behavior

Therapeutic Recreation

- 63.850 Therapeutic Recreation Services for Special Populations
- 63.852 Seminar on Programming in Therapeutic Recreation
- 63.854 Observation of Recreation Services in Treatment Settings

Outdoor Education

- 63.824 School Camping
- 63.826 Administration of Resident Camp Programs
- 63.857 European Mountaineering
- 63.858 European Backpacking and Orienteering
- 63.859 Comparative European Recreation

General Recreation Courses

- 63.813 Practicum in Clinical Recreation
- 63.814 Grantsmanship
- 63.816 Budgeting Systems
- 63.836 Public Relations in Recreation Agencies
- 66.805 Planning and Developing Facilities for Physical Education and Recreation
- 66.894 Independent Study
- Selected Interdisciplinary Courses



courses

DESCRIPTION OF COURSES

All courses carry four quarter hours of credit unless otherwise indicated. Please see the current brochure for summer, fall, winter, and spring quarter course offerings.

PHYSICAL EDUCATION

62.810 Administration of Physical Education and Athletics

Physical education and athletics discussed as an entity consistent with the current emphasis on unity, economy, and equal opportunity. Modern practices and principles of general administration applied to problems of staffing, scheduling, budgeting, collective bargaining, personnel welfare, program development, and public relations. All levels of education and the broad spectrum of programs common to physical education and athletics are considered.

62.822 Problems in Contemporary Athletics for Men and Women

Current problems, practices, and national issues pertinent to the conduct of athletic competition. National, state, and conference organizations are studied.

62.830 Curriculum Development in Physical Education

The foundations of curriculum theory, research, practice, and evaluation in American education with specific application to health and physical education. Emphasis is placed on the processes of curriculum design and implementation in school settings.

62.833 Applied Evaluation in Curriculum and Instruction

Application of current educational evaluation theory to concepts of instruction and curriculum development in health and physical education. Includes formative and summative measures applied to the improvement of instruction, assessment of process and product in the educational program, interaction analysis. *Prep. 62.830 or 66.902.*

62.835 Seminar in Curriculum and Instruction

Problems of special interest in instructional theory, curriculum theory, and applied evaluation theory. Practical papers and class presentations emphasize scholarship in the solution of problems or issues in health, physical education, or recreation. *Prep. one course from the Curriculum and Instruction concentration in health or physical education; or, 63.834.*

62.840 Advances in Instructional Concepts

Current practices in and a search for new approaches to instruction in physical education. Includes analysis of teaching and learning styles, available instructional technology and the implementation of instructional designs in health and physical education classes.

62.842 Physical Education for Students with Special Needs

Assessment, planning, instruction and evaluation practices recommended for work with special needs in physical education classes. The role of the physical educator in the resource program is explored.

62.851 Anatomic Kinesiology

A study of the human musculo-skeletal system and its relationship to human movement patterns. Electromyography is used in assessing muscle-movement relationships. Current electromyographic research and techniques are investigated.

62.852 Mechanical Analysis of Sport

Application of mechanics of motion to the analysis of human motion. Emphasis is placed on cinematography and film analysis procedures in teaching and research. *Prep. 62.851, Anatomic Kinesiology or permission of instructor.*

62.854 Physical Fitness Appraisal and Guidance

Physical fitness screening tests and procedures, developmental and rehabilitation programs, fitness-producing activities, and current trends in testing and research. *Prep. Exercise Physiology and Measurement and Evaluation, or permission of instructor.*

62.857 Trauma Diagnosis and Treatment in Sport

An investigation of injury pathology, evaluative testing, diagnosis, and appropriate treatment modalities. *Prep. undergraduate Athletic Training or experience.*

62.859 Rehabilitation from Injury in Sport

Rehabilitation procedures and techniques appropriate to the post-injury retraining of athletes. *Prep. Adapted Physical Education or permission of instructor.*

62.860 Early Childhood Motor Patterns

The sequential development of fundamental motor patterns from age zero to 10 years. How to observe youngsters in a movement situation and assess their motor patterns is studied.

62.864 Perceptual Motor Development

An overview of major theories of learning and perception as they apply to learning and refining motor skills. The interrelationships of movement

behavior and perceptual motor organization of vision, audition, proprioception, kinesthesia, and psychosocial effects are studied.

62.870 Philosophies in Physical Education

An exploration of major philosophies, past and present, and their influence on modern physical education. The student delineates his personal philosophy, explores philosophical analysis as a research technique, and reviews philosophical research. *Prep. Philosophy, Philosophy of Education, or permission of instructor.*

62.872 Comparative Physical Education

Both past and present philosophies and practices of national and international programs in physical education are compared. Historical analysis is introduced as a research technique.

62.880 Sociology of Sport

An analysis of the sociological principles and factors operative in the interaction between sport and society. Pertinent literature and research are reviewed. *Prep. General Sociology or permission of instructor.*

62.882 Psychology of Coaching and Sport

The psychodynamics of the athlete and the coach with particular reference to personality, maturation, motivation, learning, emotions, and perception. Individualized projects are required. *Prep. General Psychology or permission of instructor.*

62.884 Movement and the Learning Process

Major theories and research in learning and their application to learning motor skills. Perceptual-motor development and learning are examined; the programs evolving in this area and their implications for the teaching-learning process of motor skills are presented. *Prep. Educational Psychology or permission of instructor.*

RECREATION AND LEISURE STUDIES

63.805 Program Evaluation in Recreation

Comprehensive systems for evaluating program effectiveness studied as they relate to the consumer of recreation services. Major emphasis placed on developing an evaluation system for an agency of your choice. Case studies are drawn from the public, nonprofit and commercial sectors.

63.812 Seminar in Contemporary Issues and Problems in Recreation Services

Discussion of national and international issues, current trends, and contemporary problems as they affect recreation services.

63.813 Practicum on Clinical Recreation

A minimum of sixty (60) clock hours of supervised clinical experience, required of those students who do not have a degree in Recreation. Students

are assigned to institutions that offer services in the area of therapeutic recreation and rehabilitation, community and municipal recreation, or outdoor recreation-education.

Waiving of such requirement may be granted, dependent on the student's background and experience. *Permission of adviser.*

63.814 Grantsmanship

A seminar in which the student has the opportunity to develop a grant proposal for submission to a funding source chosen by the student. Government and foundation grant programs are explored.

63.816 Budgeting Systems

The concepts of program structure efficiency, effectiveness, and pricing are studied as they relate to program, zero-base and mission budgeting. Input-output and cost-effectiveness analyses will be used in the decisions of capital and expense budgeting.

63.824 School Camping

An independent study of the nature and conduct of outdoor recreation education as implemented in school camping programs. Problems investigated and methods developed under supervision of the faculty adviser and staff.

63.826 Administration of Resident Camp Programs

An in-depth study of staffing, sanitation and health; purchasing and storage of food, materials, equipment, and supplies; kitchen management; insurance, construction, and maintenance of buildings; and program areas as they affect resident camping programs. A study of nationwide goals and trends in the camping movement is included.

63.830 Advanced Organization and Administration of Recreation Services

Patterns for the implementation of recreation service by school systems, voluntary agencies, national service organizations, municipal governments, and state and federal agencies investigated in depth.

63.834 Programs in Recreation

An examination and evaluation of program content, leadership, administration, and facilities in recreation service, sponsored under public, private, religious, industrial, and voluntary auspices.

63.836 Public Relations for Recreation Agencies

The central purpose of public relations is to influence public opinion. This course focuses on practical and ethical aspects of public relations for recreation agencies. Case studies are drawn from the public, nonprofit and commercial sectors.

63.840 Politics and Bureaucracy in Recreation

Practical problems faced by recreation professionals in public service are investigated. Students study relationships between elected officials, bureaucrats, peers, subordinates, and supervisors in state and local governments.

63.842 Recreation and the Community School—Concepts and Practices

The role of recreation studied as an integral part of programming for the community school. An analysis of the community school concept with regard to philosophy, physical plant requirements, personnel, finance, and community involvement.

63.844 Leisure and Delinquent Behavior

Recreation studied as an intervention strategy to prevent and rehabilitate delinquent behavior.

63.850 Therapeutic Recreation Services for Special Populations

A survey of the types of therapeutic recreation services. The type, nature, cause, and prognosis of different abnormalities are studied and the impact of the disabilities on the individual, his family and community, and the role of therapeutic recreation in general.

63.852 Seminar on Programming in Therapeutic Recreation

Principles, leadership and programs in therapeutic recreation for individuals with disabilities and handicapping conditions. Emphasis on choice, adaptation, and implementation of appropriate activities. *Prep. either 63.850 or 63.854.*

63.854 Observations of Therapeutic Recreation in Treatment Settings

Guided observation sessions under professional supervision in various clinical settings. Group seminars are held to familiarize students as to the role of the rehabilitation team. *Prep. 63.850 or by permission of the instructor.*

63.857 European Mountaineering

An intense six-day course that covers the basic skills of technical climbing. The course is conducted by the International School of Mountaineering. English-speaking guides extend all students to the utmost of their abilities in various climbing situations; free climbing, ice climbing near Chamonix, France, artificial climbing, or mountain rescue. Climbing is done in a voluntary, relaxed manner with the purpose of learning to enjoy the mountains creatively and safely.

63.858 European Backpacking and Orienteering

A practical course in the basics of safe mountain living and travel on foot. Subjects covered include: group leadership, fauna and flora of the Alpine environment, mountain geology, mountain first aid, and orienteering.

Students participate in several day hikes in the vicinity of Leysin, where scenic walking paths abound, and two extended backpacking trips in contrasting areas of Switzerland. The European style of backpacking differs greatly from the traditional American practice of tenting, employing Alpine huts and refuges.

63.859 Comparative European Recreation

A presentation of recreation, European style. Through the use of guest lecturers, movies, group discussion, and field trips, the Western European approach to recreation and sports is presented. The critical contemporary issues of facility construction, program structure and development, government support, and treatment of special populations are viewed through the European perspective and compared to the American scene. Among the topics included are: recreation and tourism in a mountain society, the European club system, Swiss park construction, therapeutic recreation in Switzerland, mountain rescue, and tourism as a part of recreation. The outstanding recreation facilities of Geneva are visited during the course. A written test and paper are required.

INTERDEPARTMENTAL COURSES

10.9H7 Applied Statistics

Study of the following concepts: level of measurement, central tendency, dispersion, relatedness and significance of differences, analysis of data through correlation, regression, F-test, Chi square tests, T-test, analysis of variance, and analysis of covariance. These analyses will be accomplished using computer-based statistical subroutine packages.

66.802 Research Design and Methodology

Research methods and designs used in health education, physical education, and recreation education. Emphasis is placed on the development of research techniques including the ability to: define research problems; write hypotheses; review and interpret literature; apply research designs; organize, analyze and present data; and draw relevant conclusions. *Prep. 50.841 or permission of instructor.*

66.805 Planning and Developing Facilities for Physical Education and Recreation

The principles, terminology and standards for planning, construction and use of indoor and outdoor facilities for physical education and recreation. Integrated planning among all municipal departments is stressed.

66.814 Supervision of Professional Personnel

A study of modern personnel management as applied to staff in health, physical education, and recreation. Emphasis on task analysis, personnel, maturity for the task, leadership, and evaluative techniques.

66.874 Seminar in Issues and Trends in Health Education and Physical Education

Analysis of current issues and trends in education with special attention to health and physical education, with emphasis on systematic and practical solutions, resolutions, and adaptations.

66.886 Critical Thinking and Evaluation in Health Education, Physical Education, and Recreation Education

Investigation of the acquisition of knowledge in the three disciplines. Examination of the evaluation of knowledge and practice through experiences in decision making, logical analysis, and critical thinking.

66.890 Thesis/Project I

Initiation of a scholarly investigation under the auspices of the appropriate department. A written research proposal submitted to and approved by the student's thesis committee and an oral proposal presented at a college seminar. *A student must have the permission of his/her program adviser before registering for this course.*

66.891 Thesis/Project II

The investigation proposed in Thesis/Project I implemented with and culminated in an approved written report in thesis form. In partial fulfillment of this requirement, the student attends a series of research seminars. Upon completion, the candidate presents his thesis/project orally before the College seminar group. *Eight quarter hours for Thesis/Project I and Thesis/Project II.*

66.894 Independent Study

Under the guidance and direction of his program adviser, each student has the opportunity to develop and conduct a project related to his professional interest which includes: a statement of problem or purpose, hypothesis, an exhaustive review of literature, an appropriate research design, a standard investigating instrument or one of his own design, a small sample of the population subjected to investigation, presentation and discussion of results, and a statement of conclusions. The project is reported in thesis format when appropriate. (Credit arranged with program adviser.) *Prep. permission of program adviser.*

66.899 Seminar/Workshop

The College offers a special seminar or workshop from time to time in health, physical education, physical therapy, or recreation. Graduate credit may be granted for successful completion of a workshop, but credit may not be applied toward a degree program without the approval of the program adviser. All participants must be degree candidates in the Boston-Bouvé Graduate Program or must qualify, prior to registration, as special graduate students. Credit of one, two, three, or four quarter hours is determined by the workshop director. *Prep. permission of workshop director.*

66.901 Health Issues: Implications for Education

Identification and analysis of today's critical health issues. Increased educational involvement to fill the gap between current health knowledge and overt behavior.

66.902 Toward Accountable Health Curriculum

Exploration, assessment, and analysis of the professional team and selected health curriculum. Involvement of current educational philosophy to strengthen the ultimate goal of producing humane individuals by accountable health curriculum.

66.903 Teaching Strategies: School and Community Health Education

Essential contemporary strategies for achieving a humanizing base to reduce the time lag between relevant health information, action, values, and the modification of health behavior regarding school and community health education. Selected student projects in developing models for personal concerns.

66.904 Contemporary World Health

A survey of the state of the world's health, the progress which has been made, and the difficulties yet to be overcome. The importance of "partners in health," as compared to the solitary research worker, in reaching the current health needs. The contributions of WHO, UNESCO, UNICEF, and FAO.

66.905 Environmental Health

The study of some of the most serious problems facing mankind as people continue to pollute and ravage the environment. Student involvement in selected problem areas associated with air, water, and noise pollution; solid waste accumulation; and the use of pesticides and other pollutants.

66.906 Consumer Health

Analysis and evaluation of the concepts concerned with the careful selection of health products and services. Decision making relative to the selection of health products and services; evaluating advertising; quackery; protection against useless or dangerous products through consumer organizations are areas for student exploration and study projects.

faculty

GRADUATE TEACHING FACULTY OF BOSTON-BOUVÉ COLLEGE

- Atkinson, George R., B.S., M.S., *Instructor in Recreation and Leisure Studies*
- Christensen, Carl S., B.S., M.S., Ph.D., *Professor of Physical Education and Chairman of the Department*
- Curtin, Robert S., B.S., M.Ed., Ed.D., *Associate Professor of Physical Education*
- Dawson, Sylvia C., B.S., M.S., *Assistant Professor of Recreation and Leisure Studies*
- Fotsch, Estelle M., B.S., M.S., Ph.D., *Associate Professor of Physical Education*
- Fox, John W., A.B., M.A., Ed.D., *Professor of Physical Education*
- Garmin, Betty Gene, B.S., M.P.H., *Assistant Professor of Physical Therapy*
- Garrity, H. Marie, B.S.Ed., Ed.M., Ed.D., *Professor of Health Education and Executive Officer of the Department*
- Gillespie, William Jay, B.S., M.Ed., Ed.D., *Associate Professor of Physical Education*
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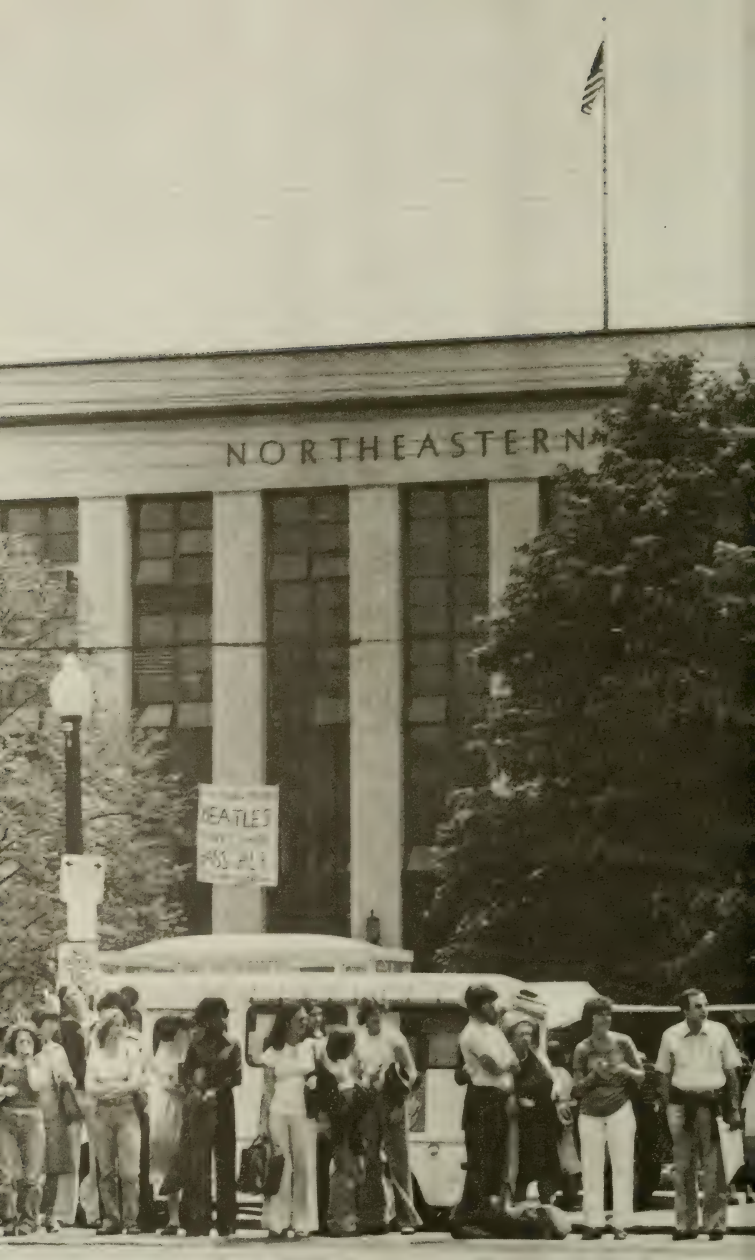
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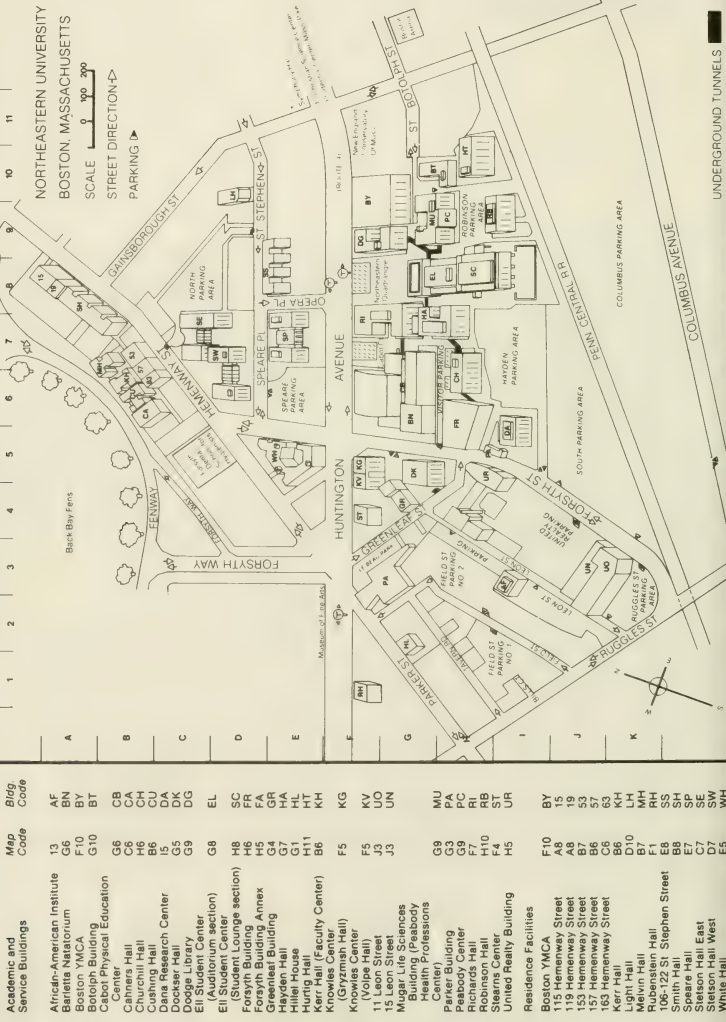
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Academic and Service Buildings	Map Code	Blgd. Code
African-American Institute	13	AF
Barietta Natatorium	G6	BN
Boston YMCA	F10	BY
Botolph Building	G10	BT
Cabot Physical Education Center	G6	CB
Cannara Hall	G6	CA
Churchill Hall	H6	CH
Cushing Hall	B6	CU
Dana Research Center	I5	DA
Dockster Hall	G5	DK
Dodge Library	G9	DG
Eli Student Center (Auditorium section)	G8	EL
Eli Student Center (Student Lounge section)	H8	SC
Forsyth Building	H6	FR
Forsyth Building Annex	H5	FA
Greenleaf Building	G4	GR
Hayden Hall	G7	HA
Hillel House	G1	HL
Hunting Hall	H11	HT
Kerr Hall (Faculty Center)	B6	KH
Knowles Center	F5	KN
(Gryzman Hall)		
Knowles Center (Voile Hall)	F5	KV
11 Leon Street	J3	UO
15 Leon Street	J3	UN
Mugar Life Sciences Building (Peabody Health Professions Center)	G9	MU
Parker Building	G3	PA
Peabody Center	G9	PC
Richards Hall	F7	RI
Robinson Hall	H10	RB
Stearns Center	F4	ST
United Realty Building	H5	UR
Residence Facilities		
Boston YMCA	F10	BY
115 Hemenway Street	A8	15
119 Hemenway Street	A8	19
153 Hemenway Street	B7	53
157 Hemenway Street	B6	57
163 Hemenway Street	C6	63
Kerr Hall	B6	66
Light Hall	D10	68
Melvin Hall	B7	69
Rubenstein Hall	F1	71
106-122 St Stephen Street	E8	SS
Smith Hall	B8	SH
Speare Hall	E7	SP
Stetson Hall East	C7	SE
Stetson Hall West	D7	SW
White Hall	E5	WH

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Representatives from the Huntington Avenue Campus will be in attendance during specified dates for guidance and counseling. The bookstore and the Bursar's Office are open from 8:30 a.m.-8:30 p.m., Monday-Thursday; 8:30 a.m.-7:00 p.m. Friday; and 8:30 a.m.-12:00 p.m., Saturday.

Program Counseling at Extensions

Program counselors are available on a regular schedule at Lincoln College extensions at Framingham North High School; Norwood North Junior High School; Weymouth High School. Appointments may be arranged by telephoning the Lincoln College office at 437-2500.

Interviews

Prospective students, or those desiring advice or guidance regarding any part of the school work or curricula, are encouraged to arrange for personal interviews. Career planning through competent guidance provides an understanding of professional requirements and develops that definiteness of purpose so vital to success. Lincoln College Office is located at 219 Hayden Hall at the Boston Campus.

Address communications to:

William F. King, Director
Lincoln College
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone 437-2500

Aviation Technology
Suburban Campus
South Bedford Road
Burlington, MA 01803

1978-1979 ACADEMIC CALENDAR

Fall Quarter 1978

Classes Begin Monday, September 25, 1978

FALL REGISTRATION DATES

Boston	5:30 - 8:00 p.m.	Tuesday-Friday September 5-8
Boston	9:00 a.m. - 12 noon	Saturday, September 9
Boston	5:30 - 8:00 p.m.	Monday-Thursday September 11-14
Burlington	5:30 - 8:00 p.m.	Monday-Thursday September 11-14
Burlington	12 noon - 8:00 p.m.	Tuesday, September 12
Brockton (Cardinal Spellman H.S.)	5:30 - 8:00 p.m.	Thursday, September 7 and Wednesday, September 13
Framingham North H.S.	5:30 - 8:00 p.m.	Tuesday, September 5 and Monday, September 11
Marshfield (Furnace Brook Jr. High)	5:30 - 8:00 p.m.	Tuesday, September 5 and Thursday, September 14
Milford H.S.	5:30 - 8:00 p.m.	Tuesday, September 5 and Tuesday, September 12
Norwood Jr. H.S. North	5:30 - 8:00 p.m.	Wednesday, September 6 and Wednesday, September 13
Reading (Austin Prep.)	5:30 - 8:00 p.m.	Tuesday, September 5 and Tuesday, September 12
Revere H.S.	5:30 - 8:00 p.m.	Tuesday, September 5 and Thursday, September 14
Weymouth North H.S.	5:30 - 8:00 p.m.	Wednesday, September 6 and Tuesday, September 12
Fall Quarter Classes Begin		Monday, September 25
Columbus Day Observed	No Classes	Monday, October 9
Veteran's Day Observed	No Classes	Saturday, November 11
Thanksgiving Recess	No Classes	Thursday-Saturday November 23-25
Final Examination Period for Fall Quarter		Monday-Saturday December 11-16

Winter Quarter 1978 - 1979

Classes Begin Tuesday, January 2, 1979

WINTER REGISTRATION DATES

Boston	5:30 - 8:00 p.m.	Monday-Friday December 4-8
Burlington	5:30 - 8:00 p.m.	Monday-Thursday December 4-7
Brockton (Cardinal Spellman H.S.)	5:30 - 8:00 p.m.	Thursday, December 7
Framingham North H.S.	5:30 - 8:00 p.m.	Monday, December 4 and Tuesday, December 5
Marshfield (Furnace Brook Jr. High)	5:30 - 8:00 p.m.	Tuesday, December 5
Milford H.S.	5:30 - 8:00 p.m.	Tuesday, December 5

Norwood Jr. H.S. North	5:30 - 8:00 p.m.	Monday, December 4 and Wednesday, December 6
Reading (Austin Prep.)	5:30 - 8:00 p.m.	Tuesday, December 5
Revere H.S.	5:30 - 8:00 p.m.	Tuesday, December 5
Weymouth North H.S.	5:30 - 8:00 p.m.	Wednesday, December 6 and Thursday, December 7
Christmas Vacation	No Classes	Monday-Monday December 18-January 1
Winter Quarter Classes Begin		Tuesday, January 2
Martin Luther King's Birthday	No Classes	Monday, January 15
Washington's Birthday Observed	No Classes	Monday, February 19
Final Examination Period for Winter Quarter		Monday-Saturday March 19-24
Spring Recess (or Make-Up Period for Lost Snow Days)		Monday-Saturday March 26-31

Spring Quarter 1979

Classes Begin Monday, April 2, 1979

SPRING REGISTRATION DATES

Boston	5:30 - 8:00 p.m.	Monday-Friday March 12-16
Burlington	5:30 - 8:00 p.m.	Monday-Thursday March 12-15
Brockton (Cardinal Spellman H.S.)	5:30 - 8:00 p.m.	Thursday, March 15
Framingham North H.S.	5:30 - 8:00 p.m.	Monday, March 12 and Tuesday, March 13
Marshfield (Furnace Brook Jr. High)	5:30 - 8:00 p.m.	Tuesday, March 13
Milford H.S.	5:30 - 8:00 p.m.	Tuesday, March 13
Norwood Jr. H.S.	5:30 - 8:00 p.m.	Monday, March 12 and Wednesday, March 14
Reading (Austin Prep.)	5:30 - 8:00 p.m.	Tuesday, March 13
Revere H.S.	5:30 - 8:00 p.m.	Tuesday, March 13
Weymouth North H.S.	5:30 - 8:00 p.m.	Wednesday, March 14 and Thursday, March 15
Spring Quarter Classes Begin		Monday, April 2
Patriot's Day Observed	No Classes	Monday, April 16
Memorial Day Observed	No Classes	Monday, May 28
Final Examination Period for Spring Quarter		Monday-Saturday June 11-16
Commencement		Sunday, June 17

Summer Quarter 1979

Classes Begin Monday, June 18, 1979

REGISTRATION FOR ENTIRE SUMMER QUARTER

Boston	5:30 - 8:00 p.m.	Monday-Friday June 4-8
Burlington	5:30 - 8:00 p.m.	Tuesday, June 5
Summer Quarter Classes Begin		Monday, June 18

REGISTRATION FOR SECOND FIVE-WEEK TERM

Boston	5:30 - 8:00 p.m.	Monday, July 16 and Tuesday, July 17
Burlington	5:30 - 8:00 p.m.	Monday, July 16
Independence Day Observed	No Classes	Wednesday, July 4
Labor Day Observed	No Classes	Monday, September 3
Final Examination Period for Summer Quarter		Held During Last Class Session of Each Term

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer and/or the Title IX coordinator.

UNIVERSITY HOLIDAYS 1978—79

Columbus Day	Monday	October 9
Veterans Day	Saturday	November 11
Thanksgiving Recess	Thursday—Saturday	November 23—25
Christmas Vacation	Monday—Monday	Dec. 18—Jan. 1
Martin Luther King Day	Monday	January 15
Washington's Birthday	Monday	February 19
Patriot's Day	Monday	April 16
Memorial Day	Monday	May 28
Independence Day	Wednesday	July 4
Labor Day	Monday	September 3

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Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. Radio stations WBZ, WEEI, WHDH, WJDA, WCOP, WRKO, WLYN, WKOX, WHAV, and WLLH will announce the University's decision to close.

In addition, the University maintains an emergency snow phone (262-SNOW). Whenever in doubt, call 262-SNOW and a taped message will indicate the status of classes.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

Important Note to Students

The Northeastern University catalog contains *current information* regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

We at Northeastern will do our best to make available to you the finest education we can provide, the most stimulating atmosphere in which to learn, and the most congenial conditions under which you may enjoy the learning experience. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. You will be a full participant in an educational partnership. We will and, indeed, can only make the opportunities available to you; it is up to you to take advantage of them.

This is equally true with your career upon graduation. We cannot guarantee that you will obtain any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state. While we will be ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because we cannot know what your expectations and understandings are unless you tell us.

In brief, what we are saying to you is that we are here to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

the university

Founded in 1898, Northeastern University is incorporated as a privately endowed, nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature, by special enactment, has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of almost 180 distinguished business and professional men and women.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964), the College of Criminal Justice (1967), and by Lincoln College's Engineering Technology Programs (1971). As an educational method the Cooperative Plan offers students the opportunity to gain valuable practical experience as an integral part of their college programs, and also provides the means by which they may contribute to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. Programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full-time during the day and want to broaden their educational background by part-time study. All formal courses of study leading to degrees through evening programs are approved by the Basic College faculties concerned and are subject to the same quantitative and qualitative standards as the regular day curricula.

UNDERGRADUATE COLLEGES

Boston-Bouvé College

Boston-Bouvé College offers four major programs of study: physical education, recreation and leisure studies, and health education, leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching as well as leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

College of Business Administration

The College of Business Administration offers programs of study in principal fields of business leading to the Bachelor of Science degree in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students have the opportunity to gain substantial practical experience as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development, which annually conducts intensive programs designed to provide professional growth for experienced managers. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the five-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy. The Center also conducts management workshops, scheduled on twelve Fridays and offering four core areas of management study.

The Bureau of Business and Economic Research provides administrative assistance on research projects carried out under faculty leadership and supervision.

College of Criminal Justice

The College of Criminal Justice offers a full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Science.

College of Education

The College of Education offers programs leading to the degree of Bachelor of Science in Education. Students in these programs have the opportunity to prepare for professional service as Elementary and Secondary school teachers, Speech-Language Pathologists or Audiologists, Music

Educators and Human Services workers. The Cooperative Plan is integral to all College of Education programs and offers a wide range of employment opportunities in school systems, libraries, social service agencies, clinics, and hospitals.

College of Engineering

The College of Engineering offers five-year cooperative curricula in civil (including an environmental engineering option), mechanical, electrical (including a power systems option and a computer engineering option), chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A more general program without specification leading to the Bachelor of Science degree is offered where students design their curriculum around a core of science, engineering science, and engineering courses (for example, computer science). For highly qualified students, most departments offer a 5-year program leading to both Bachelor's and Master's degrees; students carry course overloads beginning in the third year. The College also offers during evening hours part-time programs leading to Bachelor of Science degrees in Civil, Mechanical, and Electrical Engineering, extending over eight years and meeting the same qualitative and quantitative standards of scholarship as the day curricula.

College of Liberal Arts

The College of Liberal Arts offers majors in the arts and sciences leading to the Bachelor of Arts or Bachelor of Science degrees. Curricula are normally four years in length on a full-time plan or five years in length on the Cooperative Plan.

Lincoln College

Lincoln College offers engineering technology programs leading to the Associate in Engineering, the Associate in Science, and the Bachelor of Engineering Technology degrees. These programs are made available as:

- (a) A full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Engineering Technology (B.E.T.) in Mechanical or Electrical Engineering.
- (b) A part-time evening program including pretechnology preparatory courses and degree programs leading to the Associate in Engineering (A.E.); and the Bachelor of Engineering Technology (B.E.T.) in Civil, Mechanical, or Electrical Engineering. The Associate in Science degree may be earned in the Mathematical, Physical, and Chemical Sciences.

- (c) Lincoln College part-time students whose work schedule does not permit them to attend regular evening classes may register for a maximum of 8 quarter hours of course work per quarter in the Lincoln College Day Program.

Registration materials will be available Monday through Friday in Room 219 Hayden Hall, Boston Campus only, during the week preceding the start of each quarter. The day class schedule will not be available at other campus locations. The Registrar will not accept registration materials for day classes without the approval of the Director of Lincoln College. Tuition will be billed at normal evening part-time rates.

The day B.E.T. program is designed to meet the needs of the high school graduate or the student transferring from a community college or technical institute and who desires the full-time day curricula on the Northeastern Cooperative Plan.

In addition to its traditional curricula, Lincoln College Evening School offers interdisciplinary programs providing technological and professional development opportunities to meet special needs of the part-time student. These programs are designed to provide trained people for ready assimilation by the engineering field and to give students the opportunity to prepare for the challenge of interfacing technology and society.

College of Nursing

The College of Nursing offers two programs:

- (a) An option is offered to the licensed practical nurse to earn an Associate Science Degree in Nursing in a two year period. Candidates for this program are not required to have cooperative education experiences.
- (b) A five-year curriculum (with seven cooperative educational periods) leading to a Bachelor of Science Degree in Nursing.

All of the above qualify the graduates to write the Commonwealth of Massachusetts licensing examination for Registered Nurse.

The Baccalaureate Program provides registered nurses the opportunity to earn a Bachelor of Science Degree in Nursing. In the event of sufficient nursing-working experience, cooperative periods are waived.

Cooperative educational experiences and clinical nursing laboratories are provided by approximately twenty-five (25) metropolitan and suburban hospitals.

College of Pharmacy and Allied Health Professions

The College of Pharmacy and Allied Health Professions offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy, Bachelor of Science in Respiratory Therapy, Bachelor of Science in Toxicology, and to the Bachelor of Science degree with majors in medical

laboratory science and health record administration. Associate degree programs are offered in medical laboratory technician, respiratory therapy, and dental hygiene. The College has academic responsibility and, in cooperation with the medical schools and teaching hospitals in the Boston area, offers the professional program for physician assistants.

University College

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time day and evening programs in liberal arts, business administration, law enforcement, education, health professions, and therapeutic recreation service programs, leading to the Associate in Science, Bachelor of Arts, and Bachelor of Science degrees. It does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students. Students may pursue a degree or simply take courses, based on needs and interests, up to a total of 39-40 quarter hours of credit. Courses are offered in Boston as well as in Burlington, Framingham, Milford, Revere, Weymouth, Brockton, Norwood, Marshfield, and Reading.

Adult Day Programs refers to University College courses that are offered Monday through Friday, 9:00 a.m. to 5:00 p.m., to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day. In addition to the daytime offering of regular University College credit courses, Adult Day Programs also offers daytime workshops and conferences, sometimes over weekends, with the option for credit. Adult Day Programs are offered primarily on the Boston and Burlington campuses, with a limited number of courses offered at other off-campus locations.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston campus, Suburban campus in Burlington, and other off-campus locations near Boston.

GRADUATE SCHOOLS

Actuarial Science

Master of Science in Actuarial Science.

Arts and Sciences

The Master of Arts degree may be earned in economics, English, history, political science, psychology, and sociology. The Master of Science degree is available in biology, chemistry, economic policy and planning, mathematics, and physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the Doctor of Philosophy Degree in biology, chemistry, economics, mathematics, physics, psychology, and sociology.

Boston-Bouvé College

Master of Science with specializations in Physical Education, and Recreation and Leisure Studies.

Business Administration

Master of Business Administration.

Criminal Justice

Master of Science in Criminal Justice; Master of Science and Doctor of Philosophy in Forensic Chemistry offered in conjunction with the Institute of Chemical Analysis, application and Forensic Science.

Education

Master of Education, Doctor of Education, and the Certificate of Advanced Graduate Study.

Engineering

Master of Science degrees are offered with course specifications in the fields of Civil, Chemical, Electrical, Industrial, Mechanical, Transportation, and Engineering Management. A six year program leading to both a bachelor's and master's degree is offered in Electrical Engineering, Mechanical Engineering, and Power Systems. Professional Engineers degrees are offered in Electrical, Industrial, and Mechanical Engineering. Ph.D. degrees are offered in Civil, Chemical, Electrical, and Mechanical Engineering. A Doctor of Engineering degree in Chemical Engineering is offered in addition to the Ph.D.

Law

The School of Law offers a full-time program of professional instruction leading to the degree of Juris Doctor (J.D.). The three-year curriculum includes twelve months of professional experience in law offices, governmental agencies or other law-related employment. There are no courses for part-time or evening students.

Pharmacy and Allied Health Professions

Master of Science with specialization in Clinical Chemistry, Hospital Pharmacy, Medical Chemistry, Pharmacology, Medical Laboratory Science, Radiopharmaceutical Science, and Doctor of Philosophy in Medicinal Chemistry with specialization in Biopharmaceutics, Clinical Chemistry, Medical Laboratory Science, Pharmacology and Radiopharmaceutical Science as well as an Interdisciplinary Doctor of Philosophy program in Forensic Chemistry.

Professional Accounting

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates. The graduate schools are under the jurisdiction of the basic college deans.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

OFFICE OF LEARNING RESOURCES

The Office of Learning Resources (OLR) provides faculty, students, and staff with a variety of instructional services, equipment, and learning facilities.

The Learning Resources Center furnishes students with individualized study and language lab facilities for remedial, supplementary, or enrichment purposes in many subject areas and in many formats—programmed texts, audiotapes, videotapes, and sound filmstrips, among others. A listening lounge, equipped with a stereophonic sound system, supplies a large selection of classical and popular prerecorded music. Students may use all LRC facilities independently or to complete class assignments at no cost during day, evening, and weekend hours.

The Media Production and Training Laboratory provides facilities for both students and faculty for producing original materials, such as overhead transparencies, audiotapes, illustrations, slides, posters, and charts. Training is given in the use of all equipment, including that used for television production in a mini-studio.

Campus Media Services makes available all types of audiovisual and video equipment and instructional materials for the support of classroom instruction on a prescheduled basis. Certain equipment is reserved for student use and students may also borrow instructional materials with faculty approval. A catalog of all instructional materials is available at no charge.

The Instructional Materials Center, which acquires and maintains the collection of University-owned instructional materials, also provides a rental

service for 16mm films and videotapes obtained from outside sources. Faculty who would like to evaluate instructional materials before purchase may do so through its preview service and facilities.

The Instructional Development Center assists individual faculty with specifying instructional goals, reviewing related literature and materials, examining alternative teaching strategies, producing learning materials, and evaluating course effectiveness. Its training in presentation and teaching techniques is complementary to its basic function of developing instructional units and courses.

DAY PROGRAMS FOR ADULTS

These programs were developed to meet the needs of adults who wish to engage in part-time study during the day only. Noncredit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered.

AFFILIATED PROGRAMS

For Dental Hygienists

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern University. After receiving the Associate degree, students may pursue the Bachelor of Science degree from University College on a part-time basis.

Aviation Technology

Lincoln College conducts full-time day programs in Aviation Technology in which the student earns the Associate in Science degree and may become licensed by the Federal Aviation Administration with commercial, instrument, and instructor pilot ratings.

Health Record Administration

The University, in affiliation with several area hospitals, offers a three-year part-time evening program leading to certification in Health Record Administration for students who already hold a bachelor's degree and wish to qualify for the professional examination leading to registration as a record librarian.

For Medical Technologists, Cytotechnologists, Hematologists

In cooperation with area teaching hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Science with concentration in Medical Technology.

Bachelor of Science degree programs in Medical Technology, and Hematology and an associate degree in cytotechnology are offered on a part-time basis by University College in cooperation with several approved hospital schools.

For Nurses

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses working for their associate or baccalaureate degrees.

Physician Assistant

In cooperation with the Massachusetts Medical Society, Northeastern offers an 18-month program for the primary care physician assistant. Clinical rotations, supplemental to courses taken on campus, take place at Boston-area hospitals.

For Radiologic Technologists

University College, in collaboration with several A.M.A. affiliating hospitals in the New England area, conducts a program leading to eligibility for certification as a registered Radiologic Technologist and the Associate in Science degree. The program is accredited by the Joint Review Committee on Education in Radiologic Technology of the American Medical Association.

For Respiratory Therapists

This program is conducted by the College of Pharmacy and Allied Health Professions in affiliation with local hospitals.

HAYDEN HALL



buildings and facilities

Location of Main Campus

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 50 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Some are interconnected by underground passageways.

Carl S. Eli Student Center

The Carl S. Eli Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

The University Library

The University Library System includes the Dodge Library and the three graduate libraries: Chemistry, 112 Hurtig Hall that includes Chemical Engineering, Biology, Pharmacy and the Health Sciences; Physics/Electrical Engineering, 324 Dana Hall; and Mathematics/Psychology, 531 United Realty Building. The Suburban Campus Library supports the programs at Burlington. Other collections are Marine Science at Nahant, Center for Management Development at Andover, and Aviation Technology at

Norwood. There is also the Law Library located in the Knowles Center, and the Curriculum Resources Library in Cahners Hall.

The University Library collections consist of over 412,000 bound volumes, and 452,300 microform volumes. The periodical titles number 4,000, additional continuation titles of 1,243, and 10,000 sound recordings.

1. The Reference Collection in the Cabot Reading Room on the main floor of the Dodge Library contains 20,000 volumes. This collection is of major importance to anyone using the Library. The researcher should be aware of the source books, handbooks, bibliographies, etc., before beginning an investigation of the literature.

The Reference Division includes the Government Documents Collection located in 14 Dodge, and the Microforms Collection located in 108 DG. Additional sources of information are the Business Services, Technical Reports, Annual/Company Reports, and the Information File for pamphlet materials.

2. The Periodical Collection in the Webster Reading Room on the main floor consists of Indexing and Abstracting Services, and the current periodicals mainly in literature, humanities, social sciences, and general science, as well as foreign and domestic newspapers.

This collection supports the Reference Collection and brings up-to-date the General Collection by encompassing the latest developments in all fields of knowledge.

The Periodical Stacks are adjacent to the collection and are serviced by the library staff.

3. The General Collection is located on the three floors and two stack levels of the Dodge Library indicated by posted floor plans and guides available at the Information Desk.
4. The Reserve Book Collection is located in 204 Dodge. This is an important and heavily-used collection of textbooks and assigned reading to support the classroom lecture, laboratory, and for further in-depth information.
5. The Public Catalog located on the main floor includes author, title, and subject cards for the foregoing collections, except for documents, technical reports, and complete entries for periodicals which will be found in catalogs in those areas. The Public Catalog includes both the Dewey Decimal classification, and since April, 1971, the Library of Congress classification.
6. The Circulation Department manages the organization of the General Collection. Materials are charged out and returned at the Circulation Desk. A daily computer printout of items on loan is available to assist in locating books not found on the shelves.
7. The Inter-Library Loan Department is located in 18 Dodge. This service should be used for materials not available in the system and for serious research.
8. The Music Reference Service is located in 406 Dodge. This collection of books, scores, records, and tape cassettes is for assigned listening

and personal enjoyment. The collection contains both music and spoken word.

9. The Learning Resources Center, 406 Dodge, is a service for programmed and language instruction utilizing audio/visual/video equipment teaching programs to support classroom work and independent study.
10. It should be understood that the Divisional Libraries, the Burlington Campus, and the Law School Library have the same services and card catalogs to support those disciplines.

LIBRARY HOURS

Dodge Library

Mon.—Thurs.	7:45 a.m. to 10:00 p.m. (10:00 p.m. to midnight)*
Friday	7:45 a.m. to 7:30 p.m.
Saturday	12:00 noon to 5:00 p.m. (5:00 p.m. to 10:00 p.m.)*
Sunday	12:00 noon to 5:00 p.m. (5:00 p.m. to midnight)*

* References and Periodicals; for study only.

Divisional Libraries

Mon.—Friday.	8:30 a.m. to 10:00 p.m.
Saturday—Sunday	Closed

Suburban Campus Library, Burlington

Mon.—Thurs.	8:30 a.m. to 9:00 p.m.
Friday	8:30 a.m. to 7:00 p.m.
Saturday	8:30 a.m. to 1:00 p.m. (alternate Saturdays)
Sunday	Closed

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

The Barletta Natatorium houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library,

community recreation laboratory, folk arts center, darkroom, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults and non-credit state-of-the-art programs are offered.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is twelve miles from the main campus.

Warren Center

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports—including aquatics. Buildings include a lodge, cottages, and an infirmary.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, located about twenty miles northeast of Boston, is a research and instruction facility engaged primarily in studies of marine biology and oceanography. The Institute is operated the year around.

lincoln college administration

Administrative Officers

William F. King, B.S., M.S., P.E.

Director

Jacob Wiren, B.S., M.S., P.E.

Assistant Director

Rasma Galins, B.S.

Assistant to the Director

Student Counseling Staff

Jacob Wiren

Administrative Coordinator

Robert J. Averill, B.S., M.S.

Kenneth S. Woodard, B.S., M.E.,

Philip W. Dunphy, B.S., M.Ed.

A.G.I. (Federal)

Charles F. Field, B.S., M.Ed.

Richard E. Sprague, B.S., B.B.A.,

M.B.A., Ed.M.

Committee on Regulations and Discipline

William F. King, *Chairman*

Kenneth S. Woodard

Rasma Galins

Kenneth C. Solano

President, Adult Student Council

Academic Standing Committee

Rasma Galins, *Chairman*

William F. King

Kenneth S. Woodard

Jacob Wiren

Academic Advisory Council

William F. King, *Chairman*
Jacob Wiren, *Vice Chairman*

Leroy M. Cahoon	Walter Messcher
Edward Bobroff	Ernest E. Mills
Rasma Galins	Louis J. Nardone
C. Gregory Hood	Kenneth S. Woodard

Industrial Advisory Committee

Dr. Robert Glorioso, Supervisor, Applied
Research and Development Group
Digital Equipment Corporation
G. O. Buffington, Senior Electrical Engineer
Stone & Webster Engineering Company
Charles E. Cullen, Jr., Project Engineer
Sylvania Electric Products Company
Cameron Daley, Manager of Research and Systems Planning
Boston Edison Company
Paul F. Donahue, Computer Systems Supervisor
New England Telephone Company
Forrest Houston, Department Head of Navy Programs
Draper Laboratories
Walter Pienkus, Personnel Manager
Hewlett Packard Company
Richard F. Sette, Manager, Custom Products Operations
Genrad, Incorporated
R. F. Spousta, Manager Apprentice Operation
General Electric Company
John Thorp, Employee Relations Manager
Research, Development & Engineering Division
Foxboro Company
Joseph Yamron, Vice-President
Northrop Corporation

Curriculum Advisory Committee

William F. King, B.S., M.S., P.E.
(Academic Administration)
Chairman
Jacob Wiren, B.S., M.S., P.E.
Vice Chairman
Rasma Galins, B.S.
Secretary
Kenneth S. Woodard, B.S., M.S.

- Robert J. Averill, B.S., M.S.
(Circuit Theory & Trans. In
Linear Systems)
- Ralph S. Blanchard, Jr., B.S., M.S.,
P.E.
(Mechanical Engineering Elec-
tives)
- Edward Bobroff, B.M.E.
(Mathematics)
- Eugene G. Branca, S.B., S.M.
(Basic Mathematics)
- Franklyn K. Brown, B.S., Ed.M.
(Engineering Design)
- Ralph A. Buonopane, B.S., M.S.,
Ph.D.
(Nuclear Technology)
- Leroy M. Cahoon, B.S. in C.E., M.S.,
P.E.
(Civil Engineering Technology)
- Thomas C. Coleman, B.S.M.E.,
M.S.M.E., Ph.D.
(Thermodynamics & Heat Eng'g.)
- Warren C. Dean, A.B., M.A.
(Differential Equations)
- Paul C. Dow, Jr., B.S., M.S.E., Ph.D.
(Control Circuits & Control
Systems)
- William D. Finan, A.B., M.A., Ph.D.
(Introductory Mathematics)
- David Goldberg, B.S., M.S.
(Electrical & Electronic Graphics)
- Francis R. Hankard, B.S., M.A.
(Physics)
- Joseph J. Hansen, A.B., M.B.A.
(Mathematics for Business
Mgmt.)
- C. Gregory Hood, B.S., M.A., Ph.D.
(Physics)
- John Kaczorowski, Jr., B.S., M.S.
(Electrical Power Engineering
Tech.)
- George F. Kent, B.S., M.S., P.E.
(Materials)
- Horatio W. Lamson, B.S., M.A., P.E.
(Electrical Measurements)
- Robert S. Lang, B.S., Ed.M.
(Graphics)
- Bertram S. Long, B.S., M.S., M.E.
(Stress Analysis, Adv. Stress
Analysis)
- Anton Mavretic, B.S., M.S., Ph.D.
(Linear Active Cir. Des., Elec-
tronics, & Prin. of Comm.
Systems)
- Walter Messcher, B.M.E., M.S.
(Computer Technology)
- Robert L. Meserve, B.S., M.S.
(Fluid Mechanics)
- Ernest E. Mills, B.S., M.S., P.E.
(Mechanical Engineering Tech.,
Day and Evening Programs)
- Louis J. Nardone, B.S., M.S., P.E.
(Electrical Technology, Day and
Evening Prog.)
- Charles H. Price, Jr., B.S.E.E.,
M.S.E.E.
(Analog, Digital & Hybrid Com-
puters, Digital Systems)
- Ralph W. Sexton, B.S., M.S.
(Mechanical Tech. Laboratory)
- Raimundas Sukys, B.S., M.S.
(Pulse Circuits, Integrated Cir-
cuits)
- Willard B. Whittemore, B.S. in C.E.,
Ed.M., C.A.G.S.
(College Algebra &
Trigonometry)
- Albert G. Wilson, Jr., B.S. in C.E.,
M.S., P.E.
(Mass), S.E. (Illinois)
(Statics and Dynamics)

Office Staff

Terri L. Brandfellner, Administrative Secretary
Karen K. Rodi, Secretary
Doris F. Tortora, Secretary
Carolyn F. Hickey, Secretary of Records



the role and scope of lincoln college

Purpose

Lincoln College is charged with the responsibility for developing and offering college-level courses and curricula of an applied-science or technological nature. Its purpose is to assist professional personnel, qualified to deal with the applications and uses of the biological, natural, and physical sciences, in better meeting community needs. The programs of study conducted by the College have in common the following purposes and characteristics:

1. The programs of instruction offer the student the opportunity to prepare for activities allied to the fields of engineering, science, or medicine, but are more specialized than those required to prepare a person for full professional responsibilities.
2. The programs of instruction are more concise and more completely technological in content than professional curricula, though they are concerned with the same general fields of scientific, engineering, industrial, or clinical specialization.
3. The programs of instruction are based upon principles of science, and include post-secondary-school mathematics to provide the tools to achieve the technological objectives of the curricula.
4. Emphasis is placed upon the use of rational processes in converting theories and ideas into practical techniques, procedures, and products.
5. Extensive training for artisanship or craftsmanship is not included within the scope of the technological education programs.
6. Graduates from the associate degree programs have opportunities for educational work leading to the Bachelor of Engineering Technology and Bachelor of Science degrees.

Technology and the Technologist

Scientific and technological skills range over a broad spectrum, from extremely simple craftsmanlike activity to highly complex and abstract activity. At one end of the spectrum is the professional whose work is mostly theoretical in character. He or she studies, reasons, and visualizes how new knowledge may be used in the development of solutions to technical problems. This person usually is not completely knowledgeable of the detailed

procedures used by the skilled craftsman who executes the ideas, procedures, and designs.

The technologist is the pivot-person on the professional-technologist-craftsman team. The technologist usually works with the professional engineer, scientist, doctor, supervisor, and craftsman in converting knowledge of scientific theories and practical craftsmanship into products, procedures, and techniques.

When employed in research, design, or development, the technologist usually acts as direct supporting personnel to the professions. Functioning in a capacity related to production, operation, testing, or control, he or she usually follows a course prescribed by a professional but may not work closely under the professional's direction. If installation, maintenance, or sales are the areas of responsibility, the technologist is frequently performing a task that would otherwise have to be performed by the professional and thereby assumes the more routine professional functions demanded by our increasingly scientific and technical society.

In executing all functions, the technologist is normally required to use a high degree of rational thinking, to employ post-secondary school mathematics and the principles of the biological, natural, and physical sciences. The skilled technologist works with the mind as well as the hands; and considers why as well as how things work. The technologist must effectively communicate technical and scientific information mathematically, graphically, and linguistically.

The Need for Technologists

Our present technological age, with its exploding accumulation of new information and discoveries in the physical, natural, and life sciences, has increased the need for people with specialized training in science and technology. Experts have recently estimated that in order to meet expanding needs, the number of students graduating from the nation's professional schools must double—a goal which is improbable in the near future.

The most reasonable alternative is to make our professional manpower most efficient by providing assistance in the form of specially trained technologists. Manpower experts believe that the present ratio of less than one technologist to each professional should ideally be nearer five to one.

Opportunities for technologists are increasing. The technologist's employment opportunities are varied and include positions in health and public service organizations; atomic energy and electric power industries; metal fabricating industries; local, state, and federal government agencies; the armed forces; aerospace industries; chemical, petroleum, plastics, and metal industries; as well as transportation and communication industries.

PROGRAMS OF INSTRUCTION

Recognizing the growing need for technicians and technologists and their expanding role in modern society, Lincoln College offers Pre-Technology Preparatory Courses and degree programs leading to the Associate in Engineering (A.E.); Associate in Science (A.S.); and Bachelor of Engineering Technology (B.E.T.) as follows:

Pre-Technology

Introductory Mathematics, Basic Mathematics, Physics, and English	pages 62-63
Reading-Improvement Program (non-credit)	page 63
Programmed Instruction Review Courses (non-credit)	page 63

Aviation Technology

Aviation Technology (A.S. degree)—2 years days	page 64
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Civil Engineering Technology

Architectural Engineering Technology (A.E. degree)	page 67
Environmental Engineering (A.E. degree)	page 69
Structural Engineering Technology (A.E. degree)	page 70
Surveying and Highway Engineering Technology (A.E. degree)	page 71
Civil Engineering Technology (B.E.T. degree)	pages 72-73

Electrical Engineering Technology

Electrical Power Engineering Technology (A.E. degree)	page 75
Electronics Engineering Technology (A.E. degree)	page 76
Electrical Engineering Technology (B.E.T. degree)	pages 77-78
Electrical Engineering Technology (B.E.T. degree) (Day Cooperative Curriculum)	page 79

Mechanical Engineering Technology

Mechanical Engineering Technology (A.E. degree)	page 82
Thermofluid Engineering Technology (A.E. degree)	page 84
Mechanical Engineering Technology (B.E.T. degree)	page 85
Mechanical Engineering Technology (B.E.T. degree) (Day Cooperative Curriculum)	page 88

Interdisciplinary Science and Engineering Technology Programs

Chemical-Physical Technology (A.S. degree)	page 90
Mathematical-Physical Technology (A.S. degree)	page 92
Computer Technology (A.E. degree)	page 93

Computer Technology (B.E.T. degree)	page 94
Mechanical-Structural Engineering (B.E.T. degree)	page 96

COLLEGE OF ENGINEERING

Part-time Electrical, Civil, and Mechanical Engineering Programs (B.S. degree)

These programs are designed for fully qualified young men and women who:

1. because of family responsibilities must continue to be gainfully employed full time during the day, but who wish to advance by devoting leisure time to their own professional development;
2. were in the top half of their high school class, but at graduation were financially unable to continue their education at the college level; those who did not enjoy top-half standing may require refresher study;
3. realize that the most effective way to achieve their full potential in these days of specialization is to earn a college degree.

All of the courses in these part-time curricula are identical with those offered in the five-year, day cooperative programs and are taught by the same faculty.

The University reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

Admission Requirements for the College of Engineering

It is important that applicants for admission to the College of Engineering complete the full sequence of secondary school courses in English, Mathematics, and Science. The following subjects should be included: English (4 years), Physics or Chemistry, Algebra (through quadratics), Plane Geometry, and Trigonometry.

Admission testing requirements may be met in one of three ways:

1. by submitting the results of the College Board Scholastic Aptitude Test previously completed;
2. by writing the College Board Scholastic Aptitude Test during the current year; the Committee on Admissions provides full information about the Scholastic Aptitude Tests;
3. by completing a special battery of tests in the Northeastern University Counseling and Testing Center, Room 302, Ell Student Center.

A transfer student applying for advanced standing need not complete testing.

In evaluating the credentials of applicants, the Committee on Admissions takes into account additional study which may have been completed since secondary school and, where relevant, armed forces experience.

Applying for Admission to the College of Engineering

Applications for freshman admission and admission with advanced standing may be obtained by writing to the Department of Admissions, 150 Richards Hall, Northeastern University; or they may be secured during an admissions interview.

A personal interview is not required, but all candidates are welcome to make an appointment with an admissions counselor. Interviews may be scheduled from 8:30 a.m. to 4:00 p.m., Monday through Friday, and on Saturday from 9:00 to 11:30 a.m.

The candidate will be notified of the decision of the Committee on Admissions as soon as all credentials have been received and evaluated.

Candidates who have successfully completed courses at other institutions and who wish transfer to Northeastern should read the following information concerning special transfer programs.

Civil and Electrical Engineering Transfer Programs for Associate Degree Graduates

Students with an Associate degree from an accredited technical institute, community college, or junior college with a 2.5 cumulative average or better ($C=2.0$) may be eligible to enter a special transfer program and complete the civil or electrical engineering degree in five years. Students whose associate degree program did not include a minimum of one year of both calculus and physics will not be eligible for entry at this level.

Civil, Electrical, and Mechanical Engineering Transfer Programs for Bachelor of Engineering Technology Graduates

Students with a Bachelor of Engineering Technology degree or its equivalent from an accredited college or university, with a 2.75 cumulative average or better ($C=2.0$), may be eligible to complete one of the specified bachelor of science in engineering programs by taking a *minimum* of 40 quarter hours (10 courses) of work. The courses to be taken are assigned by a departmental adviser and are based whenever possible on the student's previous background. The average requirement has been 12 courses (48 quarter hours) which can be completed in two years. Students who have a Bachelor of Engineering Technology, Bachelor of Science in Engineering Technology, or a Bachelor of Science in Engineering degree that is not professionally accredited may be required to take significantly more courses.

All Other Transfers to the College of Engineering

Students with previous academic experience not covered in the above categories will be placed at an appropriate point in the program they select, based on a course-for-equivalent-course credit evaluation.

Questions concerning these programs may be referred to the Depart-

ment of Admissions (437-2213), or to the Office of the Dean of the College of Engineering (437-2152).

The final date of application will be Friday of the first week in September for the Fall Quarter.

Admission to the Winter and Spring Quarters is limited to transfer students only.

The College Year

Each academic year is composed of three twelve-week quarters, beginning late in September and ending about the middle of June. Full details in regard to registration are mailed approximately one month in advance. The programs are offered only at the Boston Campus.

Schedule of Classes

Class will normally meet two evenings each week, and occasionally on Saturday morning. Laboratory classes meet additional evenings.

admissions information

ADMISSION

The Student Body

The student body of Lincoln College is composed of recent high school graduates and mature men and women. Most students are employed in industry, with vocational experience ranging from very little for the recent secondary school graduate, to as much as twenty or thirty years for individuals seeking increased professional responsibility and status. Many technical career categories are represented—industrial, engineering, scientific, and allied-medical—demonstrating that, in our increasingly complex society, the key to personal advancement is education.

Academic Background

A firm knowledge of the fundamentals of mathematics and science is the foundation upon which successful achievements in the more advanced technological courses are built.

Applicants to Lincoln College are, in many cases, mature adults who, although they have experience in industry or previous education, have been away from formal study for some time and, therefore, have doubts concerning their study habits and their algebra, geometry, and science proficiency. Those who anticipate some difficulty in adjusting to the first-year course requirements are advised to give very serious consideration to enrolling in non-credit courses in introductory mathematics, introductory physics, and/or introductory chemistry. These courses are designed to develop adequate background for the basic courses in the degree programs.

Program Counseling

Career planning through self-analysis and professional counseling assists students in planning educational programs appropriate to their objectives. Entering students are encouraged to arrange for personal interviews with Lincoln College program counselors for assistance in planning their academic programs. Counselors are available by appointment at the Huntington Avenue Campus, Boston and at the other Lincoln College campuses listed on page 41. Students are encouraged to present records of prior education whenever possible. The effectiveness of the counseling review is greatly enhanced by this information. The University, through its Counsel-

ing and Testing Center and its Career Information Center, is also prepared to assist applicants whose educational and vocational goals are more complex or less firmly defined.

Application for Admission

Applications for the programs of study offered in the Lincoln College are accepted for admission to the Fall (September), Winter (January), Spring (March), and Summer (June) quarters. Applications should be filed as early as possible in advance of the opening of the quarter for which the student desires to register in order that eligibility and status may be established.

Information concerning admission may be obtained either by writing to Lincoln College or by requesting it at the time of visiting the College. The application for admission should be completed in detail and submitted to Lincoln College, Northeastern University, Boston, Massachusetts 02115.

All inquiries relative to the Day Cooperative programs should be referred to the Day College Admissions Office, 150 Richards Hall. (See pages 79 and 88.)

Mathematics Placement Test

Applicants requesting admission to regular first-year mathematics are required to demonstrate proficiency in introductory or basic mathematics through the Lincoln College Mathematics Placement Test. Students who request enrollment in the non-credit Introductory Mathematics course are not required to take the test. The Mathematics Placement Test will be administered during the registration period for each term of instruction at the Huntington Avenue Campus, Boston, and the Suburban Campus, Burlington. The Mathematics Placement Test will be administered on selected dates at the Lincoln College campuses listed on p. 41. In addition, the test is administered during the summer months. Contact the Lincoln College Office, 219 Hayden Hall, at the Boston Campus (437-2500).

Students who demonstrate satisfactory proficiency in the test will be permitted to register for the first-year courses in the program of their choice. To enroll in Engineering Physics (11.317) the student may need to take Introductory Physics.

If need for a strengthening of mathematical background is indicated, the applicant will be assigned to the Introductory Mathematics course.

Students enrolling in Introductory Mathematics may fill out their schedule by enrolling in Introductory Physics, Introductory Chemistry, or Engineering Graphics.

In every case the student should carefully consider the combined work and study load and register for only those courses which contribute to the development of a firm knowledge of fundamentals and which enable the student to adjust to academic study requirements.

CLASSIFICATION OF STUDENTS

Applicants who have filed an Application for Admission and who are approved by the Lincoln College Academic Standing Committee are admitted as regular students in the program which they have indicated on the application.

Special Students

Students having specific course needs, who do not desire a degree, may register for the courses if they have the required prerequisites or their equivalent. These students will be enrolled as "special students."

Matriculation

Petition forms of admission to the status of a degree candidate are available at offices on all Lincoln College campuses (see page 41). There are two methods of matriculation:

A. Standard Method of Matriculation

1. A student who has completed 40 quarter hours of credit in Lincoln College must file a matriculation petition to be recognized as a degree candidate.
2. The student must have a high school diploma or its equivalent and must achieve a cumulative quality point average of 2.00 (an average of C) for all courses completed before filing the petition.

B. Optional Method of Matriculation by Transfer Students

1. A student who has successfully completed an associate degree program at another accredited institution may file for matriculation following one quarter in residence in Lincoln College.
2. A student who has completed 40 quarter hours at another accredited institution may file for matriculation following one quarter in residence in Lincoln College.
3. A student who has completed 40 quarter hours of combined credit from another accredited institution and Lincoln College may file for matriculation.

All students filing for matriculation must have a high school diploma or its equivalent.

The Committee on Academic Standing may require a student to take one or more aptitude tests or interest tests if his or her credentials or academic record fail to give evidence of probable academic success. In this case, the student will be notified in writing that arrangements for testing should be made with the University Counseling and Testing Center. A fee is charged for these tests.

TRANSFER STUDENTS AND ADVANCED STANDING CREDITS

Students transferring from community colleges, junior colleges, technical institutes, or other colleges and universities may transfer applicable credits

toward the degree requirements of Lincoln College.

Students admitted with transfer or advanced standing credits from another institution must meet the requirements for admission as set forth under the regulations applicable to regular students. Advanced standing in Lincoln College may be obtained by (1) transfer of credits or (2) proficiency examination.

Transfer of Credits

Subject to the approval of the Academic Standing Committee, credits may be awarded for academic work completed in other approved schools, colleges, or universities if the following criteria are met: (a) the content of the course being submitted is equivalent to that of the corresponding course in Lincoln College; (b) the average grade achieved in the course submitted is "C" or higher; and (c) the remoteness of the time of study does not negate its use as a prerequisite for an advanced course.

Applicants desiring advanced standing credit by transfer should indicate this desire at the time of filing the application for admission. The applicant should request the Registrar of the institutions of previous attendance to mail an official transcript to the Lincoln College Office.

Proficiency Examinations

Applicants who do not meet all the criteria for the normal transfer of credits, but who are able to supply evidence of sufficient knowledge of a subject as a result of previous training or experience, may petition the Academic Standing Committee for the privilege of taking a Proficiency Examination. If satisfactory proficiency is indicated by the examination, advanced standing credits may be awarded.

Readmission

Former students who seek readmission to continue a program of study after having withdrawn from the College for a period of time, may be required to repeat courses which are prerequisites to advanced work.

REGISTRATION

Registration for Courses

Completion of admission requirements does not constitute official registration for courses. All students must be properly registered before attending classes. Registrations are processed by the Registrar's Office during the official registration periods. Former students should ascertain completion of prerequisite courses before registration. Students may register for full-year sequences of courses during the official registration periods. They are urged to register as early as possible in order to obtain the desired class schedule.

Changes in Registration

Changes in program should be initiated before the opening day of classes during the official registration periods.

Official Registration Periods

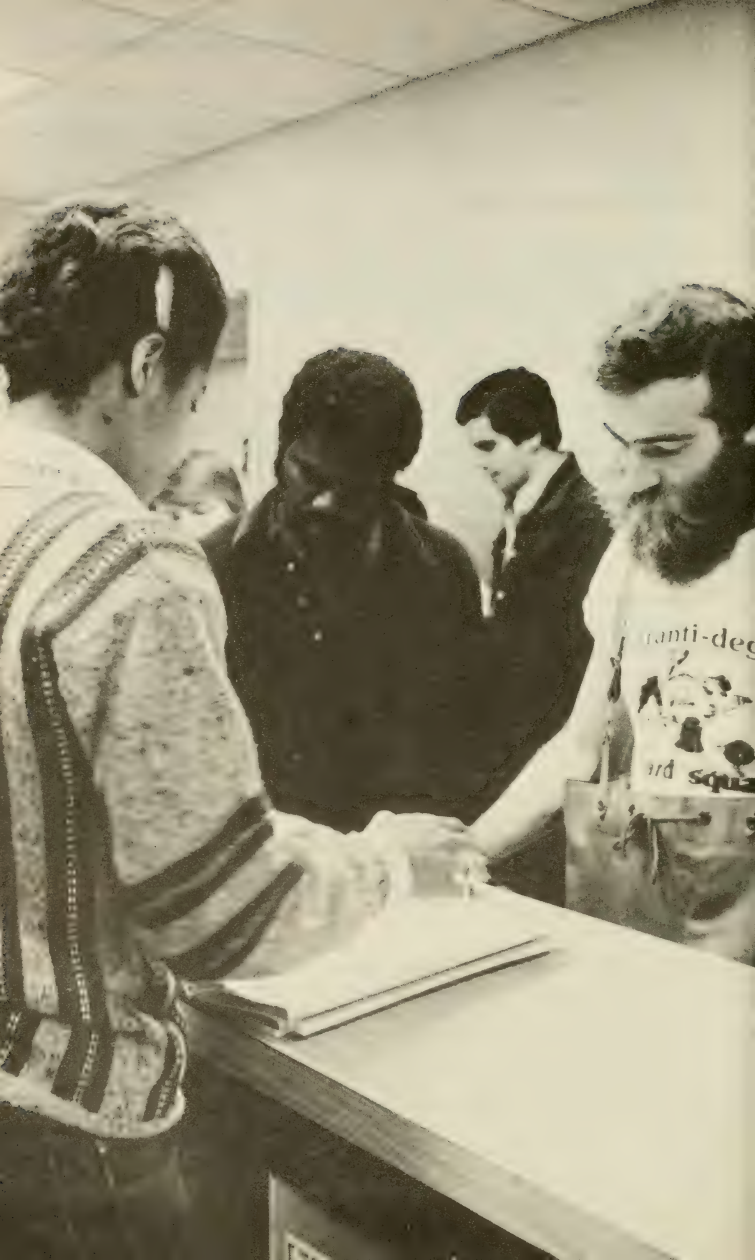
Official registration periods are scheduled before the Fall, Winter, Spring, and Summer Quarters during the academic year. Students are urged to register as early as possible during these periods. Dates of registration periods for each quarter are listed in the 1978-1979 Academic Calendar (see pages 6 and 7).

Withdrawal

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To withdraw officially from a course, the student must notify the Registrar's Office in writing or complete the appropriate withdrawal form. Properly registered students who do not attend one of the first three sessions in any course will be automatically withdrawn from the class roll.

Courses in Other Departments of the University

Lincoln College students assigned to courses in other departments of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.



academic information

ACADEMIC OPERATIONS

Campuses and Extensions

All courses are offered at the Huntington Avenue Campus, Boston, with some courses available at the Suburban Campus, Burlington; Framingham North High School, Framingham; Cardinal Spellman High School, Brockton; Norwood Junior High School North; Weymouth High Schools; Austin Prep., Reading; Milford High School; and the Revere High School; and for Aviation Technology students at the Suburban Campus, Burlington.

The Quarter Calendar

The regular school year, from September to June, is divided into three quarters of thirteen weeks each. Twelve weeks are scheduled for instruction and final examinations with one week available for makeup classes or vacation time. A limited program of courses is offered during the Summer Quarter.

Class Sessions

At the Huntington Avenue campus, lecture periods consist of one hour and forty-minute sessions beginning at 4:10 p.m., 6:10 p.m., and 8:10 p.m. each weekday and at 9:00 a.m. or 10:50 a.m. on Saturdays. At the Suburban Campus and Burlington High School, Burlington, lecture periods will begin at 4:10 p.m., 6:10 p.m., and 8:10 p.m. At the Lincoln College campuses listed above, lecture periods begin at 6:10 or 8:10 p.m. each evening. Day sessions at the Suburban Campus, Burlington begin at 8:00 a.m. each morning. Design and laboratory courses are of longer duration and may occupy a full evening. All laboratory courses are conducted on the Huntington Avenue Campus.

Course Work

All the usual methods of instruction are employed—lectures, home assignments, class projects, laboratory work, irregularly scheduled quizzes, and formal examinations. In addition, mid-course examinations are scheduled in most courses and a final examination is required at the completion of all courses. Students are responsible for fulfilling all the requirements of a course. In the event of absence, students must make appropriate arrangements for makeup with the instructor. Students must follow the procedures outlined below for makeup of missed mid-term or final examinations.

Student Study Areas

The University Library is well equipped with technical literature. A detailed statement about its facilities and hours appears on page 21.

The privilege of obtaining books from the Boston Public Library is extended to students of Lincoln College. Application for this privilege, which involves a fee, should be made directly to the Boston Public Library.

Additional study areas are available in the Ell Student Center Building.

Attendance

Students absent from regularly scheduled sessions in any subject, for whatever reason, may seriously jeopardize their academic progress and status. Students are expected to be in attendance at all the sessions scheduled in their courses. Excessive absence may be sufficient cause for the Registrar to remove the subject(s) from the student's schedule.

Withdrawal

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To withdraw officially from a course, the student must notify the Registrar's Office or complete the appropriate withdrawal form.

The Registrar will withdraw a student from a course who:

1. Does not attend one of the first three classes at the beginning of a twelve-week quarter;
2. Does not attend one of the first two classes at the beginning of a summer term.

MAKEUP EXAMINATIONS

Mid-course Examinations

A student absent from a regularly scheduled mid-course examination or quiz may request permission to take a makeup examination. This is a privilege which may be denied if abused by an excessive number of petitions or for other reasons.

Students applying for makeup examinations must:

1. Request from the instructor permission to take the mid-term examination or quiz;
2. The instructor will forward the examination to the Lincoln College Office for processing.

Makeup mid-term examinations and quizzes will be given on a Saturday at 9:00 a.m. in a designated room at the Huntington Avenue Campus according to the published schedule. Contact the Lincoln College Office, 219 Hayden Hall (Telephone 437-2500).

Any student who does not take the makeup examination as scheduled will forfeit the makeup privilege.

Missed Final Examinations

A student absent from a final examination will receive a grade of "I" (Incomplete) in the course. He or she may petition for a makeup final examination at the Registrar's Office, 120 Hayden Hall.

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege. If the petition is granted, the student must pay a \$5.00 fee for taking the special final examination. Petitions may be obtained from the Registrar's Office or in each off-campus Administration Office. Petitions for missed finals must be filed in accordance with the published schedule. Contact the Lincoln College Office, 219 Hayden Hall (Telephone 437-2500).

Students will be notified by mail when and where to take the missed final examination. All examinations will be administered on the Boston Campus. Those who do not take makeup final examinations as scheduled forfeit the makeup privilege.

ACADEMIC STANDARDS

The student is required to maintain appropriate levels of academic achievement in terms of grades, quality-point average, and the quantitative credit requirements of his program of study to satisfy academic progress criteria and achieve graduation from Lincoln College.

Grading System

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

- A (4.0)—Outstanding
- B (3.0)—Good
- C (2.0)—Satisfactory
- D (1.0)—Poor
- F (0.0)—Failure
- I (—)—Incomplete
- L Audit (No Credit)
- S —Satisfactory (Pass-Fail grade)
- U —Unsatisfactory (Pass-Fail grade)
- X —Incomplete (Pass-Fail grade)
- * Grade not received

A general average of "D" is unacceptable and will not allow a student to continue in Lincoln College or to receive a degree from Northeastern University. The "F" grade is a definite failure. The standard procedure for clearing failures in courses offered in Lincoln College is to repeat the course. In some instances circumstances may warrant amending the standard procedure. These circumstances are described in the *Student Handbook* for day students. An "I" or "X" (incomplete) grade is used for a temporary grade to show that the student has not completed the course requirements.

Pass-Fail Courses

Any student who is not on academic probation and who has completed forty quarter hours of academic work may register for one pass/fail course and, thereafter, for one course on a pass/fail basis for each ten quarter hours of successfully completed work. Written permission of the appropriate academic dean must be obtained for each pass/fail course. At no time may a student register for more than one pass/fail course per quarter.

Such courses will be restricted to free electives outside the major field of specialization, so that no part of the specifically prescribed curricula will be affected.

The grades recorded on the basis of the pass/fail system of grading will not figure in the computation of the QPA.

Auditing Policy

Students are permitted to audit courses upon filing the usual registration forms and paying the regular tuition fees. There is no reduction in fees for auditing. An auditor may participate in class discussion, complete papers and projects, and take tests and examinations for informal evaluation if desired. However, regardless of the amount or quality of work completed, **no academic credit will be granted at any time for courses audited.**

Audit Procedure

The student's decision to take a course on an audit basis must be communicated in writing to the Registrar prior to the fourth class meeting of the course. No exception to this procedure can be approved without authorization by the Academic Standing Committee of the College.

Grade Reports

Grades are mailed to the student by the Registrar and will not be given out at the office of either the Registrar or Lincoln College. Under no circumstances will grades be given over the telephone.

Quality-Point Average

The quality points earned by the student in a given course are determined on the basis of the letter grade achieved and the number of credit hours carried by the course. The total quality points earned, divided by the total number of credit hours, constitute the quality-point average.

1. When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality-point average.
2. A grade of "I" will not be considered in the calculation of the final quality-point average.
3. Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count to-

ward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality-point average computations.

4. In programs made up of combined University College and Lincoln College courses, the cumulative quality-point average will include all work in both colleges.

For example, a student who has registered for seven courses, cleared a failure in one of them and received advanced standing credit (ASC) in another, may calculate the quality-point average as follows:

Grade Achieved	Numerical Equivalent	Credit Hours	Quality Points
A	4.0	× 4 =	16.0
B	3.0	× 4 =	12.0
C	2.0	× 3 =	6.0
D	1.0	× 3 =	3.0
F	0.0	× 2 =	0.0
FB	3.0	× 2 =	6.0
I	—	× — =	—
IC	2.0	× 2 =	4.0
ASC	—	× — =	—
		—	—
		Totals 20	47.0

$$\text{Quality-Point Average} = \frac{\text{Total Quality Points (47.0)}}{\text{Total Credit Hours (20)}} = 2.350$$

The Registrar's Office will not be able to recalculate or confirm the calculations of quality-point averages for individual students. Each student's record will be brought up to date before graduation. In the meantime, borderline cases will be checked by the Lincoln College Academic Standing Committee.

Academic Progress Criteria

It is expected that the student will at all times endeavor to achieve a high record of achievement. The Academic Standing Committee reserves the right to review all students' records and deny readmission to those who fall below a minimum quality level of achievement. This requirement has been established as follows:

In order to be allowed to remain in the College, a student must have achieved a quality-point average of 1.4 at the completion of 24 quarter hours; 1.5 at the end of 48 quarter hours; and 1.6 at the end of 72 quarter hours.

It should be further noted that a student who accumulates the equivalent of six uncleared failures may be considered ineligible to continue the program of study.

Scholastic Probation

The Academic Standing Committee has the authority to dismiss from the College or place on scholastic probation any student whose scholarship is deficient for the following reasons: low quality-point average, excessive outstanding failures regardless of quality-point average.

A student on scholastic probation should be particularly diligent in current course work and make every effort to clear the academic deficiencies as soon as possible. Students whose academic record does not improve or whose failures are not properly cleared may not be allowed to register for further courses.

A student on scholastic probation who has cleared all or a substantial part of any outstanding failures may petition the Academic Standing Committee for removal from the probation list.

Disciplinary Probation

The Academic Standing Committee has the authority to dismiss from the College or place on disciplinary probation any student whom it may deem unworthy because of conduct or character. The Committee may ask any student to withdraw from the College who is obviously out of sympathy with its aims and ideals.

GRADUATION REQUIREMENTS

To receive the degree of Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology, the student must fulfill the following requirements:

1. Must have been formally accepted into "degree candidate" status by the Committee on Admissions;
2. Complete all the courses of the particular curriculum, either by attendance at Lincoln College or by receiving Advanced Standing Credit;
3. Complete associate degree programs in eight years and bachelor's programs in twelve years from the date of entrance into Lincoln College. Extensions of time may be granted by the Academic Standing Committee;
4. Be in attendance for at least a year preceding the expected graduation date; and must complete at least one-fourth of the work in Lincoln College;
5. Achieve a quality-point average of at least 1.75 in courses taken in the College to be awarded the Associate in Engineering or Associate in Science degrees, and 1.80 for the Bachelor of Engineering Technology degree;
6. Pay the Graduation Fee of \$25.

In addition, students:

7. May not earn two associate degrees or two bachelor's degrees in the same field of academic specialization;

8. Must complete a minimum of thirty quarter hours of additional credits to be awarded more than one associate or bachelor's degree;
9. May not be awarded the associate and bachelor's degree at the same commencement;
10. Must petition for transfer of credits completed at other institutions prior to January 1 of the year in which the degree is to be awarded.

ACADEMIC AND PROFESSIONAL AWARDS

The academic programs offered by Lincoln College and the teaching, counseling, and professional efforts of the faculty and staff are aimed at motivating the student toward the highest possible levels of academic achievement. To encourage scholarly and professional excellence and to recognize quality achievements, the following awards are made at appropriate times during the academic year:

Honor List and Dean's List Scholars

Students maintaining honor grade averages—minimum quality average of 3.000 and no "D" grades—during a quarter while carrying a minimum of six quarter hours credit are recognized as Dean's List Scholars. Students desiring certificates attesting to this honor should request them from the Lincoln College Office.

Scholastic Achievement Certificates

Upon graduation with an associate degree, Scholastic Achievement Certificates will be awarded to those students who have achieved distinctly superior attainment in the academic work as follows:

Scholastic Achievement	3.000-3.499 Q.P.A.
High Scholastic Achievement	3.500-3.749 Q.P.A.
Highest Scholastic Achievement	3.750-4.000 Q.P.A.

In order to be eligible for a Scholastic Achievement Certificate the student must earn a minimum of forty-eight quarter hours of credit in Lincoln College.

Graduation with Honor

Upon graduation, honors will be conferred upon students who have achieved distinctly superior academic achievement in a program leading to the Baccalaureate Degree as follows:

Honor	3.003-3.499 Q.P.A.
High Honor	3.500-3.749 Q.P.A.
Highest Honor	3.750-4.000 Q.P.A.

In order to be eligible for Honors the student must earn a minimum of seventy-two quarter hours credit in Lincoln College and receive a vote of approval from the faculty with responsibility for the program.

University Awards

The University Awards are presented annually to seniors pursuing associate degree programs, who have achieved high ranking cumulative academic records. Certificates are awarded at the Annual Class Day ceremony.

Technology Awards

The Technology Awards are presented annually to seniors pursuing associate degree programs, who have demonstrated superior academic and professional capabilities in their special career fields. Appropriate certificates are distributed to outstanding students enrolled in the following program categories:

Civil Engineering Technology
Aviation Technology
Computer Technology
Electrical Engineering Technology
Mechanical Engineering Technology

Class Marshal Award

The Class Marshal Award is presented annually at the Class Day Banquet for Graduates, to the top ranking senior in a baccalaureate program. The award consists of an appropriate certificate, and the President's Letter of Commendation.

Sigma Epsilon Rho Awards

Sigma Epsilon Rho, the evening colleges' scholastic honor fraternity, annually awards plaques and scholarships for outstanding scholastic achievement to the highest ranking students in University and Lincoln Colleges at the end of their junior year.

Sigma Epsilon Rho Honor Society Scholarship Award

The Sigma Epsilon Rho Honor Society Scholarship Award, established in 1974 by the membership of the Society, is awarded annually to a student of University and/or Lincoln College. Eligible students must have a cumulative Quality Point Average of 3.0 or better after completing 80 percent or more of their required studies.

Alumni Award for Professional Promise

Established in 1947 by the Northeastern University Alumni Association, the Alumni Award for Professional Promise is presented annually at a final senior class meeting in the spring of the year. The award is made to the senior who has demonstrated unusual professional promise through character traits, scholastic achievement, and work performance.

Leslie B. Cutler Aviation Awards

The Leslie B. Cutler Aviation Awards were established by the members of the Aero Club of New England to honor and give recognition to the late Senator Cutler's service and devotion to the interests of aviation in the Massachusetts General Court, national legislative bodies, and her private life. These scholarship awards are made to students in the Commercial Aviation Technology Program who most typify the same interest, devotion, and leadership demonstrated by Senator Cutler during her long and distinguished public career.



financial information

TUITION

Initial Registration Fee

A nonrefundable \$10.00 registration fee, required of all new students, is due and payable upon registration.

Tuition

Tuition for all part-time evening courses is \$46.00 per quarter hour of credit. Tuition for Day BET students will be based on the current day school rate. Charges for registration and tuition for special courses are at the rate specified for each course. Students are permitted to audit courses; however, there is no reduction in fees for auditing.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing, nor permitted to reenroll in the University, nor have degrees conferred, until all financial obligations to the University have been met.

No certificate of honorable dismissal will be issued to any student who has not fully met his financial obligations to the University.

Non-credit courses are charged at quarter-hour rates equal to those of credit courses meeting on an equivalent contact-hour schedule.

Courses in Other Departments of the University

Students assigned to courses in other departments or colleges of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.

Aviation Technology Tuition (Day Program)

The amount of flight instruction required by each aviation student is not fixed. Since each student progresses at his or her own pace, exact tuition quotes cannot be made for the complete program. Students will be free to negotiate the flight tuition with the several flight schools approved by the University.

Day Program Tuition Deposit

Applicants accepted for admission to the day program must upon request pay a nonreturnable tuition deposit of \$100 as evidence of their intention to enroll; this will be applied to their first tuition payment.

Tuition for all courses is charged on a quarter basis and is payable in full

at the beginning of each quarter. As a convenience without additional charge, and at the student's request, the Bursar's Office will allow payment in two installments.

Deferred-Payment Privilege

Occasionally situations develop, usually beyond the control of the student, which make it difficult to meet payments in the regular manner. Under such circumstances the student is advised to discuss the problem personally with the Bursar's Office where a convenient deferred-payment agreement can be worked out. A service fee of \$2.00 is charged for this privilege.

Late Payment Fee

Payments of tuition are due by Saturday of the week in which the bill is dated. If payment, or a deferred-payment agreement is not arranged by that date, a late fee of \$10.00 is charged by the Bursar.

Refund of Tuition

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specified conditions are met. Questions regarding refunds should be discussed with the Bursar.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar in Room 120 Hayden Hall. Non-attendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

Official withdrawal filed within:	Percentage of tuition
1st week of quarter	100%
2nd week of quarter	75%
3rd week of quarter	50%
4th week of quarter	25%

Tuition Underwritten by Employers

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases in which payment is made directly by the employer to the University, the student should furnish the Bursar's Office a purchase order covering the registration or a statement from an officer of his or her company certifying that the company is underwriting the tuition.

Student Bursar

All inquiries about student accounts should be directed to the Student Account Bursar, 437-2270.

Veterans' Benefits

Veterans' benefits depend on course load and increase sharply when a student's program exceeds eight quarter hours per quarter. Questions and applications should be directed to Room 321B Hayden Hall.

SPECIAL FEES**Student Center Fee**

Students attending the Huntington Avenue Campus, Boston, in the evening in a part-time program of study will be assessed a Student Center Fee of 75¢ per quarter.

Health Service Fee

Students attending the Boston, full-time Day Co-op B.E.T. programs are required to pay a Health Service Fee of \$140.00. The program is available to Aviation Technology Students on an optional basis.

Missed Final Examination Fee

Students absent from the regularly scheduled final examination at the end of a course may petition for a "special final examination." The fee for each examination requested by the student is \$5.00. The fee must be paid when the petition is filed in the University Registrar's Office.

Proficiency Examination Fee

Applicants for admission may petition to be awarded advanced standing on the basis of achievement demonstrated by a "proficiency examination." The fee for each examination requested by the applicant is \$10.00. The fee must be paid when the petition is filed in the Lincoln College Office.

Graduation Fee

The University graduation fee, charged to candidates for the associate or bachelor's degree, is \$25.00 payable on or before May 1 of the year in which the student expects to graduate.

Transcript of Record Fee

Students may request transcripts of their records at the University Registrar's Office. There is no charge for the first transcript. After the initial transcript there is a charge of \$1.00 per copy, payable in advance. If more than one transcript is requested at one time the charge is \$1.00 for the first copy and 50¢ for each additional copy.

TEXTBOOKS AND SUPPLIES

Students purchase their own textbooks and work materials. The cost varies according to the subject for which the student is enrolled. The average cost for a normal program of four subjects generally ranges from \$30.00 to \$65.00. Textbooks for single courses range from \$4.00 to \$25.00.

Students enrolled in Engineering Graphics should be prepared to spend \$10.00 to \$15.00 for drawing supplies and \$10.00 to \$20.00 for a set of drawing instruments in addition to the textbooks.

LOAN PROGRAMS

Full-time students in Lincoln College who are pursuing the B.E.T. Program should refer to the Undergraduate Catalog for financial aid information.

FINANCIAL AID

The Office of Financial Aid, located in 254 Richards Hall, offers several types of assistance to part-time students. All awards are based on financial need. Aid granted from programs sponsored by the federal government is dependent upon the amount of funding allocated to Northeastern University. The University does not award financial assistance in any form to students who are not citizens or permanent residents of the United States.

Basic Educational Opportunity Grants (BEOG)

The Basic Educational Opportunity Grant program is a federal aid program designed to provide financial assistance to those who need it to attend post-high school educational institutions. Basic Grants are intended to be the "floor" of a financial aid package and may be combined with other forms of aid in order to meet the full costs of education. BEOG is a grant and, unlike a loan, does not have to be repaid. Half-time students taking at least 6 credit hours each quarter may now apply. Awards range up to one-half the maximum allowable by law contingent upon the total cost of education. Applications are available in the Office of Financial Aid, 253 Richards Hall, or by writing to BEOG, Post Office Box 84, Washington, D.C., 20044.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic workload, are accepted as degree candidates, i.e. have 40 credit hours and a matriculation certificate, and who show evidence of financial need.

Students may borrow as much as \$1,500 each academic year, up to the maximum of \$5,000 for their undergraduate education, or a total of \$10,000 through the completion of graduate studies. Repayment and interest on these loans does not begin until nine months after the student ceases to

carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a ten-year period with the interest at the rate of 3% per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Borrowers who elect to teach the disadvantaged or handicapped may qualify for cancellation of their entire obligation at the rate of 15% per year of teaching service. A borrower serving as a full-time member of the Armed Services of the United States is entitled to cancel 12½% per annum of the principal outstanding on any loans, for each year of such service, up to a maximum cancellation of 50%.

Community Sources

Students and their families are urged to explore community, industrial, and foundation sources for collegiate financial aid. Parental employers or the appropriate union organization may be a source. In addition, local, civic, political, religious or educational leaders are often aware of aid sources in the immediate community. Some typical sources may include: P.T.A., Kiwanis, Lions, Elks, Knights of Columbus, Masons, Sons of Italy, Rotary, State Rehabilitation, American Legion, etc.

University Grants

Each year Northeastern University grants a substantial number of full and partial tuition grants to students who have demonstrated both above-average scholastic achievement and financial need. All applications for aid are automatically considered for all grants administered by the University. It is not necessary for an applicant to specify the grant in which he is interested.

Veterans' Benefits

Any veteran covered by the Veterans Readjustment Act of 1966. Public Law 89-358, should report to Room 321B Hayden Hall to fill out the proper enrollment forms. These forms will be made available during registration periods for all students in the Law Enforcement Programs at special off-campus locations.

Students needing additional information as to eligibility, allowances, or other details are urged to contact their local office of the Veterans Administration as early as possible.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to \$2,000 a year (the law allows a maximum of \$2,500 per year) depending on

financial need. The Federal Government pays the interest while the student is in school if the student is eligible for interest subsidy.

Applications for this loan are available from local banks or the Education Office of your state government. Additional information is available from the Financial Aid Office.

Martin Luther King Jr. Scholarships

Established in 1969 in memory of the late Rev. Dr. Martin Luther King Jr. Awards are made as openings occur to adults from minority groups who would otherwise be unable to continue their education. Stipends will cover tuition expenses not to exceed six quarter hours in any academic quarter (excluding the Summer Quarter).

H. Patricia Taylor Scholarship Fund

The H. Patricia Taylor Scholarship Fund was established in 1974 by H. Patricia Taylor, a graduate of University College, and her husband, Harry C. Taylor, a graduate of the School of Business. The Scholarship expresses their appreciation for financial assistance made available to Mrs. Taylor while obtaining her degree, and is an attempt to provide similar funds to assist others in realizing their potential through higher education. The income from the Scholarship Fund will be awarded annually to a student enrolled in University College or Lincoln College who demonstrates financial need and academic stability and who meets certain other conditions of eligibility.

The University does not award financial assistance in any form to non-citizens of the United States.

student activities and alumni information

Evening Student Council

The Evening Student Council was formed to provide a representative body to promote the welfare of the student body in non-academic areas and to foster extracurricular activities which will enrich University life. It affords participants opportunities to meet and develop close personal relationships with fellow students and administrative staff.

The Evening Student Council provides students with opportunities to develop leadership skills and gives them a chance to discuss matters of professional interest with experts in their chosen field.

The Council is made up of interested students in University and Lincoln College, representatives of part-time interest groups, and those specially certified by the Council because of their demonstrated interest in the overall adult programs of the University.

The E.S.C., a member of the United States Association of Evening Students Councils, meets evenings on a monthly basis. Students are welcome to visit, observe, and express opinions concerning evening student life.

Social and Professional Clubs

Student activities for part-time students are planned, organized, and operated by the student body with the assistance of the Director of University-Lincoln College Student Activities. The programs are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in University College and Lincoln College are welcome to participate.

The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The Office of University-Lincoln College Student Activities is particularly interested in developing new clubs which will benefit students professionally and educationally. If students wish to start clubs related to their professions, this office will help them plan and organize on the local and national level. The program is dedicated to assisting the adult student in the development of his or her fullest potential. The University-Lincoln College Student Activities Office is located in 102 Churchill Hall.

Use of Gymnasium Facilities

Specific schedules for use of the pool, weight training room, indoor athletic field and track, gymnasium, and wrestling room are set up each quarter for use by all part-time students. In order to become eligible, students must ob-

tain a temporary Gymnasium Pass each time they wish to use the Cabot Gymnasium Complex. Passes are available in Cabot Room 111, Monday through Friday from 4:30 p.m. to 9:30 p.m. and on Saturday and Sunday from 1:00 p.m. to 4:00 p.m. All students requesting a pass must present their Student Identification Card. Students using the Cabot Gymnasium Complex are required to abide by all the rules of the gym and may be asked to complete a Medical Release Form. Revised schedules for holiday periods will be posted.

Alpha Eta Rho

The Nu Epsilon Chapter of this international aviation fraternity is a social organization open to all Aviation Technology students. It is organized to actively associate the interested students of aviation with leaders and executives in the industry. This close association, strengthened through the bonds of an international aviation fraternity, establishes opportunities for members in their relation to aviation and inspires interest and cooperation among those in the profession who are also members of Alpha Eta Rho.

Alumni Association

More than 78,000 alumni are members of the all-University Alumni Association, which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters is located in Room 101 Ell. The official records and addresses of alumni are maintained in Room 260, United Realty Building.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in each of the colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than fifty Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the alumnae organization and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association

presents trophies to the outstanding athlete of the year in each of the six major sports.

One of the most recent developments in alumni activities is the organization of seminars which are conducted by the Association in cooperation with the University's Center for Continuing Education. The seminars are designed particularly for alumni who have a special interest in current events and the field of adult education.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.

Alumni Relations

The Alumni Association is providing a uniquely valuable service to both the University and the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. These meetings, held in cooperation with the Northeastern Department of Admissions, have been extremely well attended. Local residents as well as alumni of the University have been invited to these conferences, which help to clarify many of the questions today's parents and young people have concerning application procedures of colleges and universities.

Placement Service

Many requests from employers are received by the College for men and women of potential ability to fill important positions of responsibility. It is the policy of the College to serve the students whenever possible by placing them in those positions which promise attractive opportunities for development and advancement. The College cannot guarantee to place its students, but it does endeavor to keep in close touch with those who desire placement service and to assist them in obtaining satisfactory advancements in positions and income. No charge is made for placement service. Those needing this assistance should arrange an appointment with the Director of Placement.

While the College cannot guarantee positions to its graduates, the number of requests usually exceeds the number available in the graduating class of any given year. The policy of the College is to find the best qualified men and women among its graduates for the positions which the College is called upon to fill.

The College, in recommending a graduate for a position, furnishes the prospective employer with the facts as to the graduate's ability, character, attitudes, habits, and other qualifications for the position as revealed by the College records. In the last analysis, however, placement in a position depends largely upon the graduate's ability to sell his or her services to the prospective employer. Most employers prefer to consider two or more candidates for a position and generally ask the College to suggest more than one person. Many manufacturing and commercial firms throughout New England call upon the College to assist them in filling important executive and managerial positions.



academic programs of instruction

SCOPE OF PROGRAMMING

Lincoln College, either by itself or in collaboration with University College, conducts educational programs at the undergraduate level in the following areas of technology:

- Pre-Technology Preparation
- Aviation Technology
- Science Technology
- Civil Engineering Technology
- Electrical Engineering Technology
- Mechanical Engineering Technology
- Computer Technology

Program Selection

Students should determine that the program they desire is offered in a suitable time period. Most programs are offered in the evening on a part-time basis. However, Aviation Technology is offered only on a full-time day basis.

In the fields of Electrical Engineering Technology and Mechanical Engineering Technology, full-time day cooperative programs were established in the fall of 1971. Students may enter as freshmen or transfer with advanced standing by applying to the Office of Admissions, Northeastern University, 150 Richards Hall.

Degrees and Certificates

Lincoln College conducts education programs on the undergraduate level in various technological areas leading to the following degrees and certificates:

1. Associate in Science degree (A.S.) requiring 96 to 105 quarter hours of credit;
2. Associate in Engineering degree (A.E.) requiring 96 to 103 quarter hours of credit;
3. Bachelor of Engineering Technology degree (B.E.T.) requiring 180 to 183 quarter hours of credit;
4. Most courses are available for special students.

Opportunities for Associate Degree Graduates

Graduates of the Engineering or Science Technology Programs in Lincoln College, or other similar colleges and institutions, who have earned the Associate in Engineering or the Associate in Science degrees, may transfer applicable credits toward the degree requirements in the baccalaureate programs in Engineering Technology, Medical Technology, or Industrial Technology.

Those who have maintained a quality-point average of 2.500 or higher in the Associate degree programs may apply for transfer to either of the following College of Engineering curricula: (1) day-college Cooperative Education programs in Civil, Mechanical, Electrical, or Industrial Engineering with credit for up to two years of the five-year program; or (2) the part-time evening programs in Civil, Electrical, or Mechanical Engineering with credit for the first three years of the eight-year programs. Fractional credit may be awarded to students with a quality-point average slightly lower than 2.500.

PRE-TECHNOLOGY PREPARATION

(Non-Credit)

Beginning students who have been away from formal study for some time are frequently concerned about their study habits and their verbal, mathematical, and scientific backgrounds. Applicants who anticipate some problems should give serious consideration to enrolling in the non-credit introductory courses, the Reading Improvement Program, or doing review work through programmed instruction at the Learning Center.

Introductory Courses

These courses offer the student the opportunity to develop background for basic courses in the degree programs and thus increase the probability of successful achievement in advanced technology courses.

Introductory Mathematics I and II

A two-quarter review of high school algebra and some plane geometry designed to prepare students for the course 10.307 College Algebra and Trigonometry I. These courses are required of students who do not demonstrate sufficient algebra proficiency on the Mathematics Placement Test. (See course description for 10.301 and 10.302, page 132.)

Introductory Physics I and II

A two-quarter relatively non-mathematical introduction to the concepts of physics designed to allow students to prepare themselves for the courses 11.317 Physics I or 11.304 General Physics I. (See course description for 11.301 and 11.302, page 136.)

Basic Mathematics I and II

A two-quarter review of basic algebra offers students the opportunity to prepare themselves for the course 10.327 Mathematics I. These courses are required of students who do not demonstrate sufficient proficiency in algebra on the Mathematics Placement Test. (See course descriptions for 10.330 and 10.331, page 134.)

English for International Students I, II, III

A three quarter, non-credit sequence for foreign-speaking students covering introduction to English grammar with emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation; preparation of written and oral reports, business and social correspondence; and advanced work in written and spoken English preparatory to entering 30.305 English I.

GENERAL INTEREST COURSES

The following courses of general interest are offered for students who desire to inquire into the technical fields but may not have the mathematical background to pursue the professional courses. In general, these courses may not be substituted for similar courses in the several technical curricula.

1. Technology of Modern Architecture I, II
2. Man and Materials
3. Electric Devices and Systems I
4. Electric Devices and Systems II
5. Interpretation of Industrial Drawings
6. Foundations of Mathematics I
7. Foundations of Mathematics II
8. Foundations of Mathematics III
9. Man's Physical Environment I
10. Man's Physical Environment II

Reading Improvement

The ability to read well is one of the most important basic tools for the successful completion of a college program. The University's Center for Reading Improvement gives the student an opportunity to develop good reading habits in preparation for the intensive reading assignments of college-level courses. The following core skills are covered: previewing, locating main ideas and related details, using guide words and phrases, identifying structural patterns, outlining and summarizing, note-taking, vocabulary building, skimming and scanning, speed-reading, and critical reading. Further information may be obtained at the Center for Reading Improvement.

Programmed Study

Students may enroll in non-credit, self-study courses to better prepare themselves for college academic work and strengthen their high school

background at the University's Learning Center.

Courses which may be useful to students in the Lincoln College programs in technology are: slide rule, trigonometry, effective listening, spelling, algebra, study skills, calculus, and English.

University Learning Center hours:

Monday, Tuesday, Wednesday, Thursday—8:00 a.m.-8:00 p.m.

Thursday—closed 12:50 p.m.-1:50 p.m.

Friday—8:00 a.m.-7:00 p.m.

Saturday, Sunday—1:00 p.m.-5:00 p.m.

AVIATION TECHNOLOGY PROGRAM

The Aviation Technology program offered by Lincoln College through its Federal Aviation Administration Approved Pilot Ground School offers exposure to the scientific, technological, and business backgrounds required by the modern commercial pilot or entrepreneur in today's aviation and aerospace world as it operates within the framework of the total ship-rail-motor-aircraft transportation industry.

The tremendous expansion of aviation as an increasingly important sector of the nation's industrial economy has accelerated the demand for appropriately trained and educated personnel for careers related to the flight, instructional, regulatory, management, and technical aspects of the aviation industry.

Flight opportunities range from pilot or co-pilot in the single- or multi-engine air-taxi and cargo services of the local, fixed-base feeder airlines or private company, to flight engineer, first officer, or captain in the high-speed, multi-jet-engined services of the national and international systems of the major airlines.

The education-training-regulation sector of the aviation industry provides additional career opportunities as flight, ground, or simulator instructors or as flight examiners, training or safety directors, and supervisors in the licensing and regulatory agencies of local, state, or federal government.

Persons knowledgeable in the technology and regulation of aviation, who are also skillful in dealing with people, may pursue challenging and rewarding careers in aviation sales, airport operations, aviation business management, etc.

The Aviation Technology related program presently offered by Lincoln College is a two year full-time day program which leads to an Associate in Science degree.

This program is conducted at the Suburban Campus in Burlington and local air fields. Aviation students at Northeastern University need their own transportation and will be required to find living accommodations, since there are no dormitories on this campus.

Flight Facilities

Students in the flight portion of the Aviation Technology Program will be permitted to pursue their flight training at either Wiggins Airways or at the Comerford Flight School.

Wiggins Airways, located at Norwood Municipal Airport, has been in operation since 1929. In addition to their flight school, they offer air taxi, rental, maintenance, repair, aircraft service and parts, and electronic and helicopter service. The flight dispatch and instructional staff numbers approximately 25, all qualified by education, training, certification, and rating to perform their various functions.

Comerford Flight School is located at Hanscom Field in Bedford. It is the oldest flight school at Hanscom and specializes in training airplane pilots. All instructors are federally certified and hold advanced pilot credentials.

Students will be required to make individual arrangements for their flight training and will be awarded credit based on the successful completion of the F.A.A. rating being sought. Quarterly reports will be submitted to the adviser of the program regarding each student's progress in the flight programs.

Aviation Technology

Major Code 096

Leading to the Degree of Associate in Science (Day Program—2 years)

The Curriculum of the Aviation Technology program offers students the opportunity to prepare themselves in the shortest reasonable time to assimilate the required amount of related academic instruction and accumulated flight time for certification with the Private and Commercial Instrument Ratings by the Federal Aviation Administration.

Prerequisites: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II (10.301 and 10.302), medical certificate—F.A.A. Class I or II, interview with Director of Flight Instruction and Aviation Program Counselor.

First Year

Course Number				Total Yearly Q.H.
10.307, 10.308, 10.320*		Algebra & Trigonometry I, II, Calculus I		8 or 12*
96.404		Fundamentals of Aeronautics		4
	96.392	Air Science and Navigation B		3
30.305		English I		3
	93.404	Technical Communications		3
11.317, 11.318, 11.319		Physics I, II, III		12
	96.399	Flight Physiology		2
	96.395	Meteorology & Climatology A		3
	96.393	Advanced Air Science A		3
		Private Flight Lab		4

Second Year

96.324,	96.325	Introductory Avionics; Avionics	8
48.314		Air Transportation	3
	96.372	Airline Traffic and Sales A	3
96.367		Intermodal Transportation	3
96.308		Aircraft Power & Systems	4
96.396		Meteorology & Climatology B	3
96.394		Advanced Air Science B	3
	96.376, 96.377	General Aviation Oper A & B	6
	41.301, 41.302	Accounting Principles I & II	6

Flight Option

Commercial Flight Lab	8
Instrument Flight Lab	4

Total A.S. Degree	96
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*Optional

Second Year (Non-Flight Options)

Students electing the Non-Flight Option will replace the commercial flight courses with a sequence of air transportation, law enforcement, engineering, or airport management courses. These courses are listed under the description of courses at the end of the catalog.

Students having definite plans to enter other upper class programs following the completion of the Associate degree should consult their adviser regarding entrance requirements prior to registering for second-year courses.

Students completing the Associate and Bachelor's program may acquire the scientific, technological, and business background for employment in a variety of positions including: Flight Crew Officers, Airport Management, Fixed Base Operations, Air Transportation, Aviation Sales, F.A.A. positions, etc.

CIVIL ENGINEERING TECHNOLOGY PROGRAMS

Civil Engineering deals with the planning and construction of all kinds of relatively permanent structures and public works. Its major functions are: the preparation of surveys (topographical, geological, traffic, utility, etc.); the design of structures (buildings, bridges, dams, harbor facilities, etc.); the planning of municipal systems (water, sanitary, gas, flood control, air pollution control, etc.); and the development of transportation facilities (highway, railway, waterway, airway, etc.).

In performing these functions, the civil engineer usually works in close association with professionals in the field and may develop technologically to function independently and in positions of managerial responsibility.

Employment opportunities for Civil Engineering Technology Program graduates are with town, city, state, or federal public works departments and agencies; private consulting, engineering, architectural, and construction organizations; and with railroads and the military. Job opportunities will also depend upon the economy and the abilities of the individual.

The Civil Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Architectural Engineering Technology	page 67
Environmental Engineering Technology	page 69
Structural Engineering Technology	page 70
Surveying and Highway Engineering Technology	page 71

Bachelor of Engineering Technology Degree

Civil Engineering Technology	page 72
Mechanical-Structural Engineering Technology	page 96

Architectural Engineering Technology

Major Code 025

Leading to the Degree of Associate in Engineering

The program in Architectural Engineering Technology offers students the opportunity to prepare to assume responsibilities in the planning, design, and construction of buildings. Employment opportunities are with architectural groups, consulting engineering firms, and government agencies. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trig. I, II	8
10.320	Calculus I	4
*09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
30.305, 30.306	English I, II	6
93.404	Technical Communications	3

Second Year

10.321, 10.322, 10.323	Calculus II, III, IV	6
11.317, 11.318, 11.319	Physics I, II, III	12
02.501, 02.502, 02.503	Statics, Structural Mechanics, Strength of Materials I	6

Third Year

02.507, 02.508	Strength of Materials II, Stress Analysis	4
39.301	Economic Principles and Problems	3
01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
01.401, 01.402	Technology of Modern Architecture I, II	4
01.390	Construction Administration	2

Fourth Year

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.331, 01.332, 01.333	Steel Design I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
01.393, 01.394, 01.395	Architecture Design I, II, III	6

Total A.E. degree	100
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Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

* 27.541, 542, 543 Drawing I, II, III (*Prereq. none*)—a basic drawing course in developing pencil, pen, and wash techniques; and the study of basic drawing problems using a variety of media—may be used to supplement this program.

Environmental Engineering Technology**Major Code 011***Leading to the Degree of Associate in Engineering*

The program in Environmental Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the design, construction, operation, and supervision of municipal plants and systems concerned with the storage and distribution of water and also the disposal of sewage and waste in urban areas with due consideration for contamination and pollution. Employment opportunities are with town, city, and state public works departments, private engineering consultants, architects, contractors, and many other engineering organizations. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
30.305, 30.306	English I, II	6
93.404	Technical Communications	3

Second Year

10.321, 10.322, 10.323	Calculus II, III, IV	6
11.317, 11.318, 11.319	Physics I, II, III	12
02.501, 02.502, 02.503	Statics, Structural Mechanics, Strength of Materials I	6

Third Year

02.507, 02.508	Strength of Materials II, Stress Analysis	4
39.301	Economic Principles and Problems	3
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
12.444, 12.445, 12.446	General Chemistry I, II, III	9

Fourth Year

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
01.351, 01.352, 01.353	Environmental Engineering I, II, III	6

Total A.E. degree 103

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Structural Engineering Technology

Major Code 012

Leading to the Degree of Associate in Engineering

The program in Structural Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the planning, design, and supervision of the construction of buildings, bridges, foundations; flood-control projects and all fixed structures. Employment opportunities are with consulting engineering firms, architectural groups, contractors, railroads, government agencies, the military, and other design-related companies. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year

Course Number			Course	Q.H.
10.307,	10.308		College Algebra & Trigonometry I, II	8
		10.320	Calculus I	4
09.311,	09.312,	09.313	Engineering Graphics I, II, III	6
30.305,	30.306		English I, II	6
		93.404	Technical Communications	3

Second Year

10.321,	10.322,	10.323	Calculus II, III, IV	6
11.317,	11.318,	11.319	Physics I, II, III	12
02.501,	02.502,	02.503	Statics, Structural Mechanics, Strength of Materials I	6

Third Year

02.507,	02.508		Strength of Materials II, Stress Analysis	4
		39.301	Economic Principles and Problems	3
01.321,	01.322,	01.323	Introduction to Structures I, II, III	6
09.351,	09.352,	09.353	Principles of Computer Programming I, II, III	6
01.301,	01.302,	01.303	Surveying I, II, III	6

Fourth Year

01.324,	01.325,	01.326	Structural Analysis I, II, III	6
01.331,	01.332,	01.333	Steel Design I, II, III	6
01.371,	01.372,	01.373	Reinforced Concrete Design I, II, III	6
01.361,	01.362,	01.363	Materials & Soil Mechanics I, II, III	6

Total A.E. degree 100

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Surveying and Highway Engineering Technology**Major Code 013***Leading to the Degree of Associate in Engineering*

The program in Surveying and Highway Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the preparation and calculation of preliminary and legal surveys required for both small projects such as subdivision work, individual lot layouts, and highway layouts, as well as more complex projects relating to sewer systems, pipelines, power transmission lines, dams, reservoirs, and aqueducts. Employment opportunities are with independent surveying companies, civil engineering companies, highway, transit, and railroad planning groups, as well as cartographers, construction companies, and contractors. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
30.305, 30.306	English I, II	6
93.404	Technical Communications	3

Second Year

10.321, 10.322, 10.323	Calculus II, III, IV	6
11.317, 11.318, 11.319	Physics I, II, III	12
02.501, 02.502, 02.503	Statics, Structural Mechanics, Strength of Materials I	6

Third Year

02.507, 02.508	Strength of Materials II, Stress Analysis	4
39.301	Economic Principles and Problems	3
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
01.301, 01.302, 01.303	Surveying I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6

Fourth Year

01.304, 01.305, 01.306	Advanced Surveying I, II, III	6
01.307, 01.308	Legal Aspects of Surveying I, II	4
01.390	Construction Administration	2
01.311, 01.312, 01.313	Highway Engineering I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6

Total A.E. degree 100

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Civil Engineering Technology

Major Code 014

(Accredited—Engineers' Council for Professional Development)

Leading to the Degree of Bachelor of Engineering Technology

The program in Civil Engineering Technology offers the student the opportunity to prepare to assume broad responsibilities related to surveys required to develop initial design criteria and specifications, and to become involved in the planning, design, and construction of all kinds of relatively permanent structures, municipal plants and systems, or transportation systems and facilities. Employment opportunities are in private consulting firms, construction companies, and public works agencies. Work involving surveying, design, and supervision is open to graduates. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year				
Course Number		Course		Q.H.
10.307,	10.308		College Algebra and Trigonometry I, II	8
	10.320		Calculus I	4
09.311,	09.312,	09.313	Engineering Graphics I, II, III	6
30.305,	30.306		English I, II	6
	93.404		Technical Communications	3
Second Year				
10.321,	10.322,	10.323	Calculus II, III, IV	6
11.317,	11.318,	11.319	Physics I, II, III	12
09.351,	09.352,	09.353	Principles of Computer Programming I, II, III	6
Third Year				
02.501			Statics	2
	02.502		Structural Mechanics	2
	02.503		Strength of Materials I	2
01.301,	01.302,	01.303	Surveying I, II, III	6
12.444,	12.445,	12.446	General Chemistry I, II, III	9
23.301,	23.302,	23.303	History of Civilization I, II, III	9
Fourth Year				
02.504			Particle Dynamics	2
	02.507		Strength of Materials II	2
	02.508		Stress	2
01.341,	01.342,	01.343	Fluid Mechanics I, II, III	6
01.321,	01.322,	01.323	Introduction to Structures I, II, III	6
39.301,	39.302,	39.303	Economic Principles and Problems I, II, III	9

Fifth Year

01.324,	01.325,	01.326	Structural Analysis I, II, III	6
01.331,	01.332,	01.333	Steel Design I, II, III	6
01.304,	01.305,	01.306	Advanced Surveying I, II, III	6
(),	(),	()	*Technical Elective	6

Sixth Year

01.371,	01.372,	01.373	Reinforced Concrete Design I, II, III	6
01.361,	01.362,	01.363	Materials and Soil Mechanics I, II, III	6
(),	(),	()	Technical Elective I, II, III	6
(),	(),	()	*Laboratory Elective I, II, III	6

Seventh Year

01.311,	01.312,	01.313	Highway Engineering I, II, III	6
01.351,	01.352,	01.353	Environmental Engineering I, II, III	6
19.301,	19.302,	19.303	Psychology I, II, III	9
(),	(),	()	*Technical Elective	6

Total B.E.T. degree	183
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Suggested Electives

01.307,	01.308		Legal Aspects of Surveying I, II	4
03.316			Land Use Planning	2
01.327,	01.328,	01.329	Advanced Structural Analysis I, II, III	6
01.334,	01.335,	01.336	Advanced Structural Design I, II, III	6
01.401,	01.402		Technology of Modern Architecture I, II	4
		01.390	Construction Administration	2
01.393,	01.394,	01.395	Architectural Design I, II, III	6
01.314,	01.315		Surveying Practice I, II	4

Laboratories

01.310			Surveying Laboratory	2
01.364			Materials and Soil Mechanics Laboratory	2
01.380,	01.381,	01.382	Environmental Laboratory	6
02.531			Measurement and Analysis Laboratory	2
	02.532,		Mechanical Eng. Technology Laboratory	2

Elective courses for which proper preparation exists may be chosen from within or outside the Civil Engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology programs desiring to pursue programs leading to the Bachelor of Science in Engineering degree at North-eastern University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

* Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Academic Standing Committee.
10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

ELECTRICAL ENGINEERING TECHNOLOGY PROGRAMS

Electrical Engineering deals with the design and operation of equipment and systems related to power, communications, data-processing, and electrical control. Its major functions are: 1) the generation, transmission and distribution of electrical energy for light and power purposes; 2) the development and production of equipment for telephone, radio, television, radar, and communication; 3) the design and construction of data-processing systems and analog or digital computers; and 4) the application of electrical and electronic devices in the control of processes and manufacture.

Employment opportunities for the Electrical Engineering Technology graduate are in public and private research laboratories, engineering consulting groups dealing with industrial and plant applications, design organizations dealing with operation and manufacture, sales engineering, and the electric utility industry. Job opportunities will depend on the economy and the individual's abilities.

The Electrical Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Electrical Power Engineering Technology	page 75
Computer Technology	page 93
Electronics Engineering Technology	page 76

Post-Associate Degree Certificate

Control Systems Engineering Technology	page 94
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Bachelor of Engineering Technology Degree

Electrical Engineering Technology	pages 77-78
(Accredited by Engineers' Council for Professional Development)	
Computer Technology	page 94

The program in Electrical Engineering Technology leading to the Bachelor of Engineering Technology is also offered as a day cooperative program. A specimen curriculum is shown on page 79. For further information please call (617) 437-2200, or write:

Dean of Admissions
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115

Electrical Power Engineering Technology**Major Code 032***Leading to the Degree of Associate in Engineering*

The program in Electric Power Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the design, installation, operation, and maintenance of electrical machinery, power and control apparatus, and larger equipment employing heavy currents. The curriculum includes the study of the generation, transmission, and distribution of electrical energy for light and power, and the application and operation of electrical machinery in industry.

Employment opportunities are in public and investor-owned electrical utilities, electrical manufacturing companies, consulting engineering firms, control equipment design organizations, and communications companies. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

03.304, 03.305, 03.306	Circuit Theory IV, V, Electrical Measurements	6
03.346, 03.347, 03.348	Electronics for Industry I, II, III	6
03.331, 03.332, 03.333	Energy Conversion I, II, III	6
	Technical Elective I, II, III	6

Fourth Year

03.334, 03.335, 03.336	Control Circuits I, II, III	6
03.337, 03.338, 03.339	Basic Power Systems I, II, III	12
03.341, 03.342, 03.343	Power and Control Labs. I, II, III	6

Total A.E. degree 96

Suggested Technical Electives

04.381, 04.382, 04.383	Nuclear Technology I, II, III	6
02.351, 02.352, 02.353	Thermodynamics I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Electronics Engineering Technology

Major Code 033

Leading to the Degree of Associate in Engineering

The program in Electronic Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the design, development, and operation of communications, data-processing, and electronic control equipment for applications in computers, military and space explorations, and in automated industrial production equipment. Employment opportunities are in communications equipment, electrical manufacturing, data-processing and control, equipment organizations, as well as other engineering-oriented companies. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year				
Course Number		Course		Q.H.
10.307,	10.308	College Algebra & Trigonometry I, II		8
	10.320	Calculus I		4
11.317,	11.318,	11.319	Physics I, II, III	12
Second Year				
03.301,	03.302,	03.303	Circuit Theory I, II, III	6
09.307,	09.308,	09.309	Electrical and Electronic Graphics I, II, III	6
10.321,	10.322,	10.323	Calculus II, III, IV	6
11.321,	11.322,	11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices	6
Third Year				
03.304,	03.306,	03.323	Circuit Theory IV, Electrical Measurements, Electronic Lab.	6
03.311,	03.312,	03.313	Electronics I, II, III	12
09.351,	09.352,	09.353	Principles of Computer Programming I, II, III	6
Fourth Year				
03.314,	03.315,	03.316	Pulse and Digital Circuits I, II, III	6
*03.317,	03.318,	03.319	Principles of Communication Systems I, II, III	12
03.327,	03.328,	03.329	Advanced Electronic Labs. I, II, III	6
Total A.E. degree				96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

*03.387, 03.338, 03.389 Active Integrated Circuits I, II, III
plus
03.381, 03.382, 03.383 Linear Active Circuit Design I, II, III
may be substituted for 03.317, 03.318, 03.319 Principles of Communication Systems I, II, III.

Electrical Engineering Technology**Major Code 035**

(Accredited by Engineers' Council for Professional Development)

Leading to the Degree of Bachelor of Engineering Technology

The program in Electrical Engineering Technology offers the student the opportunity to prepare to assume broad responsibilities related to the design, development, operation, installation, and production of a wide variety of electrical and electronic equipment concerned with the generation and utilization of electric energy, communications, data-processing, and industrial control. Employment opportunities are in public and private research laboratories, engineering consulting firms dealing with industrial and plant applications, electric utilities, electrical and electronic organizations concerned with operation, manufacture, installation, and sales. Job opportunities will also depend on the economy and the student's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introduction Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year

Course Number	Course	Q.H.
09.307, 09.308, 09.309	Electronic Graphics I, II, III	6
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
30.305, 30.306	English I, II	6
93.404	Technical Communications	3

Second Year

09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
11.317, 11.318, 11.319	Physics I, II, III	12

Third Year

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6
11.321, 11.322, 11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices	6
23.301, 23.302, 23.303	History of Civilization I, II, III	9

Fourth Year

03.304, 03.306	Circuit Theory IV, Electrical Measurements	4
()	Liberal Arts Elective	3
03.311, 03.312, 03.313	Electronics I, II, III	12
†03.324, 03.325, 03.323	Circuits Laboratory I, II and Electronic Lab.	6

† 03.324, 03.325 Circuits Laboratory is required for students having no previous degrees. Transfer students with an Associates degree should take 03.349 Advanced Electronics Lab. IV and 03.350 Advanced Electronics Lab. V.

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Fifth Year

03.331,	03.332,	03.333	Energy Conversion I, II, III	6
03.361,	03.362,	03.363	Transients in Linear Systems I, II, III	6
39.301,	39.302,	39.303	Economic Principles and Problems I, II, III	9
(),	(),	()	*Elective I, II, III	6

Sixth Year

†03.317,	03.318,	03.319	Principles of Communications Systems I, II, III	12
03.327,	03.328,	03.329	Advanced Electronic Labs. I, II, III	6
(),	(),	()	*Elective I, II, III	6

Seventh Year

03.371,	03.372,	03.373	Analog and Digital Computer Technology I, II, III	6
03.377,	03.378,	03.379	Control Systems I, II, III	6
19.301,	19.302,	19.303	Psychology I, II, III	9
(),	(),	()	*Elective I, II, III	6

Total B.E.T. degree	181
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Suggested Technical Electives

03.314,	03.315,	03.316	Pulse and Digital Circuits I, II, III	6
03.337,	03.338,	03.339	Basic Power Systems I, II, III	12
03.341,	03.342,	03.343	Power & Control Labs. I, II, III	6
03.396,	03.397,	03.398	Basic Optics for Instrumentation, Optical Instrumentation I, II	6
03.374,	03.375,	03.376	Digital Systems I, II, III	6
**03.381,	03.382,	03.383	Linear Active Circuit Design I, II, III	6
03.384,	03.385,	03.386	Microwave Semiconductor Devices and Circuits I, II, III	6
**03.387,	03.388,	03.389	Integrated Circuits I, II, III	6
09.354,	09.355,	09.356	Computer Systems I, II, III	6
09.357,	09.358,	09.359	Computer Aided Design I, II, III	6
09.361,	09.362,	09.363	Computer Controlled Systems I, II, III	6
03.360			Introduction to Radar Systems	4
11.324			Introductory Survey of Lasers	2
03.305			Circuit Theory V	2

Electrical Engineering Technology courses of elective nature may be chosen from the above list of courses.

Elective courses for which proper preparation exists may be chosen from within or outside of the electrical engineering discipline.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern

*Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.

10.351, 10.352, 10.353 Advanced Mathematics I, II, III is recommended for all students planning advanced engineering technology subjects.

† 03.337, 03.338, 03.339 Basic Power Systems I, II, III may be substituted for 03.317, 03.318, 03.319 Principles of Communication Systems.

03.341, 03.342, 03.343 Power & Control Labs I, II, III may be substituted for 03.327, 03.328, 03.329 Advanced Electronic Labs. I, II, III.

University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

Electrical Engineering Technology

(Day Cooperative Curriculum)

Leading to the degree of Bachelor of Engineering Technology

First Year			Q.H.
Course Number		Course	
10.407, 10.408		College Algebra & Trigonometry I, II	8
	10.420	Calculus I	4
11.417, 11.418, 11.419		Physics I, II, III	12
30.113		Freshman Writing	4
	30.114, 30.115	Introduction to Lit., Great Themes in Lit.	8
09.421, 09.422, 09.423		Principles of Computer Programming I, II, III	6
09.461, 09.462, 09.463		Engineering Design Graphics I, II, III	6
	11.373, 11.374	Physics Lab. I, II	4
Second Year			
10.421, 10.422		Calculus A, B	8
03.451, 03.452		Circuit Analysis I, II	8
11.420		Physics IV	4
	03.440	Physical Electronics	4
	03.424	Circuits Lab. I	2
(I) (II)		Liberal Arts Elective I, II	8
*Third Year			
03.460		Engineering Analysis I	4
	03.430	Energy Conversion	4
03.453, 03.454		Circuit Analysis III, IV	8
03.411, 03.412		Electronics I, II	8
39.115		Principles of Economics	4
	03.410	Electrical Measurements	4
03.425, 03.423		Circuits Lab. II, Electronic Lab.	4
Fourth Year			
03.470		Digital Computers	4
	03.477	Control Engineering	4
03.413		Electronics III	4
03.427, 03.428		Advanced Electronic Lab. I, II	4
(I) (II)		**Technical Elective (A or B) I, II	8
	(II)	Liberal Arts Elective II	4

*Note: Students desiring to terminate their program at the end of Quarter 7 may petition to be awarded the Associate in Engineering degree.

**Technical Elective A: Power Systems Sequence

Technical Elective B: Communication Engineering (See next page).

Fifth Year			
03.478		Control Engineering II	4
	03.437	Distrb. Systems	4
03.429		Advanced Electronic Lab. III	2
	02.419	Mechanics	4
(I)	(II)	Liberal Arts Electives I, II	8
(I)		**Technical Elective (A or B) III	4
	(II)	Technical Elective	4
			<hr/>
Total B.E.T. degree			180 Q.H.

TECHNICAL ELECTIVE SEQUENCES

Power Systems Sequence			
03.462		Basic Power Systems I	4
03.463		Basic Power Systems II	4
03.464		Basic Power Systems III	4
		Technical Elective (selected from below)	4
Communication Engineering Sequence			
03.417		Principles of Communication Systems I	4
03.418		Principles of Communication Systems II	4
03.419		Principles of Communication Systems III	4
		Technical Elective (selected from below)	4
Suggested Technical Electives			
03.417		Principles of Communication Systems I	4
03.462		Basic Power Systems I	4
03.490		Optical Instrumentation	4
04.481		Nuclear Technology	4

Graduates of the Day Bachelor of Engineering Technology program who have maintained a superior level of achievement and who wish to continue their academic studies may be qualified to enter the part-time or full-time program leading to the Bachelor of Science in Engineering. For further information contact the Lincoln College Office at 219 Hayden Hall, telephone 437-2500.

** 03.387, 03.388, 03.389 Integrated Circuits I, II, III
plus
03.381, 03.382, 03.383 Linear Active Circuit Design I, II, III
may be substituted for 03.317, 03.318, 03.319 Principles of Communication Systems I, II, III.

MECHANICAL ENGINEERING TECHNOLOGY PROGRAMS

Mechanical Engineering deals with the harnessing of power resources by means of machinery to perform useful work. In contrast to civil engineering, which deals primarily with static forces and structures, mechanical engineering is more concerned with the motion and kinetics of devices which are activated by hydraulic, electrical, mechanical, or thermodynamic forces. Major functions of the mechanical engineer are: 1) design and installation of all kinds of machinery from pocket watches to the largest of steel boring mills; 2) development and production of engines and transportation equipment (automobile, aircraft, ship, railway, etc.); 3) construction and operation of furnaces, boilers, and heating and air-conditioning equipment for the control of atmospheric and environmental conditions.

Employment opportunities for Mechanical Engineering Technology graduates are in the areas of 1) research, design, or development; 2) production, operation, testing, or control; 3) installation, maintenance, and sales. In performing these functions, graduates will work in close association with professionals in the field and may develop technologically so as to function independently and in positions of managerial responsibility. Job opportunities will also depend on the economy and the individual's abilities.

The Mechanical Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Mechanical Engineering Technology	page 82
Thermofluid Engineering Technology	page 84

Bachelor of Engineering Technology Degree

Mechanical Engineering Technology (Accredited by Engineers' Council for Professional Development)	page 85
Mechanical—Structural Engineering Technology	page 96
(Accredited by Engineers' Council for Professional Development)	

The program in Mechanical Engineering Technology leading to the Bachelor of Engineering Technology is also offered as a day cooperative program. A specimen curriculum is shown on pages 88 and 89. For further information please call (617) 437-2200, or write:

Dean of Admissions
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115

Mechanical Engineering Technology

Major Code 021

Leading to the Degree of Associate in Engineering

The program in Mechanical Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the design, production, and installation of mechanical tools, machinery, engines, and transportation equipment in which there is an intermingling of mechanical and hydraulic forces. Because of the increased mechanization of all industry, varied employment opportunities are available in private engineering consultant groups, in light and heavy industries, and in almost all engineering design organizations. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year			
Course Number		Course	Q.H.
10.307, 10.308		College Algebra and Trigonometry I, II	8
	10.320	Calculus I	4
09.311, 09.312, 09.313		Engineering Graphics I, II, III	6
30.305, 30.306		English I, II	6
	93.404	Technical Communications	3
Second Year			
09.351, 09.352, 09.353		Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323		Calculus II, III, IV	6
11.317, 11.318, 11.319		Physics I, II, III	12
Third Year			
02.501		Statics	2
02.502		Structural Mechanics	2
	02.503	Strength of Materials I	2
02.541		Mechanical Behavior of Materials	2
02.542		Physical Behavior of Materials	2
	02.543	Materials and Processes	2
09.314		Engineering Design I	2
02.526		Mechanical Design I	2
	05.580	Engineering Economy	2
11.373 11.374		Physics Laboratory I, II	4
()		Liberal Arts Elective	3

Fourth Year

01.341,	01.342,	01.343	Fluid Mechanics I, II, III	6
02.504			Particle Dynamics	2
	02.505		Kinematics of Bodies	2
		02.506	Body Dynamics	2
02.507			Strength of Materials II	2
	02.508		Stress Analysis	2
		02.509	Deflection Analysis	2
02.531			Measurement and Analysis Laboratory	2
	02.532,	02.533	Mechanical Technology Laboratory	4
				<hr/>
Total A.E. degree				100

Thermofluid Engineering Technology

Major Code 022

Leading to the Degree of Associate in Engineering

The program in Thermofluid Engineering Technology offers the student the opportunity to prepare to assume responsibilities related to the design, operation, and construction of engines and equipment in which there are thermodynamic, hydraulic, and mechanical forces. Typical examples are automobile, aircraft, and ship engines; boilers and furnaces; and heating, air conditioning, and ventilating devices. Employment opportunities are with architectural firms, engineering consultants, light and heavy mechanical industries, and other engineering-oriented organizations. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year				
Course Number		Course		Q.H.
10.307,	10.308	College Algebra and Trigonometry I, II		8
	10.320	Calculus I		4
09.311,	09.312,	09.313	Engineering Graphics	6
30.505,	30.306		English I, II	6
	93.404		Technical Communications	3
Second Year				
09.351,	09.352,	09.353	Principles of Computer Programming I, II, III	6
10.321,	10.322,	10.323	Calculus II, III, IV	6
11.317,	11.318,	11.319	Physics I, II, III	12
Third Year				
02.351,	02.352,	02.353	Thermodynamics I, II, III	6
02.501			Statics	2
	02.502		Structural Mechanics	2
		02.503	Strength of Materials I	2
09.314			Engineering Design I	2
	02.526		Mechanical Design I	2
		05.580	Engineering Economy I	2
11.373,	11.374		Physics Laboratory I, II	4
	()		Liberal Arts Elective	3
Fourth Year				
01.341,	01.342,	01.343	Fluid Mechanics I, II, III	6
02.531			Measurement and Analysis Laboratory	2
	02.535,	02.536	Thermodynamics Technology Laboratory I, II	4
02.554,	02.555		Heat Transfer I, II	4
		02.556	Heat Exchanger Design	2
02.557			Heat Engines and Turbines	2
	02.558		Refrigeration	2
		02.559	Air Conditioning	2

Mechanical Engineering Technology**Major Code 023**

(Accredited by Engineers' Council for Professional Development)

Leading to the Degree of Bachelor of Engineering Technology

The program in Mechanical Engineering Technology offers the student the opportunity to prepare to assume broad responsibilities related to the design, development, production, operation, and installation of all kinds of machinery, engines, and transportation equipment as well as boilers, furnaces, and heating or air conditioning equipment which involve interactions of mechanical, hydraulic, and thermodynamic forces. Employment opportunities are in industry producing mechanized and automated equipment, in design and engineering organizations, and in companies dealing primarily with manufacture and production. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements in Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra and Trigonometry I, II	8
10.320	Calculus I	4
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
30.305, 30.306	English I, II	6
93.404	Technical Communications	3

Second Year

09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
11.317, 11.318, 11.319	Physics I, II, III	12

Third Year

02.351, 02.352, 02.353	Thermodynamics I, II, III	6
02.501	Statics	2
02.502	Structural Mechanics	2
02.503	Strength of Materials I	2
03.320, 03.321, 03.322	Electricity and Electronics I, II, III	6
11.373, 11.374	Physics Laboratory I, II	4
()	Liberal Arts Elective	3

Fourth Year

01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.504	Particle Dynamics	2
02.505	Kinematics of Bodies	2
02.506	Body Dynamics	2
09.314	Engineering Design I	2
02.526	Mechanical Design I	2
05.580	Engineering Economy I	2
23.301, 23.302, 23.303	History of Civilization I, II, III	9

Fifth Year

02.507		Strength of Materials II	2
	02.508	Stress Analysis	2
		02.509	Deflection Analysis
02.531		Measurement and Analysis Laboratory	2
	02.532, 02.533	Mechanical Technology Laboratory I, II	4
02.541		Mechanical Behavior of Materials	2
	02.542	Physical Behavior of Materials	2
		02.543	Materials and Processes
02.554, 02.555		Heat Transfer I, II	4
		02.556	Heat Exchanger Design

Sixth Year

02.534			Thermofluids Laboratory	2
	02.535,	02.536	Thermodynamic Technology Laboratory I, II	4
02.557			Heat Engines and Turbines	2
	02.558		Refrigeration	2
		02.559	Air Conditioning	2
19.301,	19.302,	19.303	Psychology I, II, III	9
(),	(),	()	*Technical Elective I, II, III	6

Seventh Year

02.527, 02.528, 02.529		Mechanical Design II, III, IV	6
39.301, 39.302, 39.303		Economic Principles and Problems I, II, III	9
() () ()		Technical Elective I, II, III	6
() () ()		Technical Elective I, II, III	6

Total B.E.T. degree	181
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Suggested Technical Electives

02.337, 02.338, 02.339		Mechanical Vibrations I, II, III	6
02.344, 02.345, 02.346		Applied Metallurgy I, II, III	6
02.510		Advanced Stress Analysis	2
	02.511, 02.512	Experimental Stress Analysis I, II	4
02.560, 02.561		Power Generation I, II	4
	02.562	Power Engineering	2
05.581		Engineering Economy II	2
	05.582, 05.583	Industrial Technology I, II	4
04.381, 04.382, 04.383		Nuclear Technology I, II, III	6

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical,

* Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Academic Standing Committee.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

Civil, and Mechanical Engineering are available on a part-time as well as a regular day cooperative program. Industrial, and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Mechanical Engineering Technology

(Day Cooperative Curriculum)

Leading to the Degree of Bachelor of Engineering Technology

First Year			
Course Number		Course	Q.H.
10.407, 10.408		College Algebra & Trigonometry I, II	8
	10.420	Calculus I	4
11.417, 11.418, 11.419		Physics I, II, III	12
30.113		Freshman Writing	4
	30.114, 30.115	Introduction to Lit., Great Themes in Lit.	8
09.421, 09.422, 09.423		Principles of Computer Programming I, II, III	6
09.461, 09.462, 09.463		Engineering Design Graphics I, II, III	6
	11.373, 11.374	Physics Labs. I, II	4
Second Year			
10.421, 10.422		Calculus A, B	8
02.411, 02.412		Mechanics A, B	8
09.464		Engineering Design Graphics IV	4
	02.414	Stress Analysis A	4
02.431		Materials A	4
	02.461	Machine Shop (Industrial Engineering elective on petition with experience)	4
*Third Year			
02.413		Mechanics C	4
	03.420	Electricity & Electronics I	4
02.415		Stress Analysis B	4
	02.468	Mechanical Technology Laboratory II	2
02.462		Mechanical Lab. I	2
02.421, 02.422		Thermodynamics A, B	8
39.115		Principles of Economics	4
	02.441	Fluid Mechanics A	4
Fourth Year			
02.417, 02.418		Mechanical Design A, B	4&2
02.469, 02.464		Heat Technology Laboratory I	
		Mechanical Tech Lab. III	4
02.442		Fluid Mechanics B	2
	02.423	Thermodynamics C	4
(I) (II)		Technical Elective I, II	8
(I)		Liberal Arts Elective I	4
(II)		Liberal Arts Elective II	4

*Note: Students desiring to terminate their program at the end of Quarter 7 may petition to be awarded the Associate in Engineering degree.

Fifth Year

Course Number	Course	Q.H.
(I)	Liberal Arts Elective	4
02.467	Project Lab.	4
02.466	Heat Lab. II	2
(II)	Technical E	
02.424	Thermodynamics D	2
(I) (II)	Technical Elective I, II	8
(I) (II)	Liberal Arts Elective I, II	8
Total B.E.T. degree		180

Technical Electives Must Be Chosen From the Following List

02.416	Stress Analysis C	4
02.452	Exp. Stress Analysis	4
02.451	Mech. Vibrations	4
02.432	Materials B	4
02.433	Applied Metallurgy	4
02.425	Thermodynamics E	4
10.423	Differential Equations	4
03.421	Elect. & Electronics II	4
03.490	Optical Instrumentation	4
04.481	Nuclear Technology	4

Graduates of the Day Bachelor of Engineering Technology program who have maintained a superior level of achievement and who wish to continue their academic studies may be qualified to enter the part-time or full-time program leading to the Bachelor of Science in Engineering. For further information contact the Lincoln College Office at 219 Hayden Hall, telephone 437-2500.

**INTERDISCIPLINARY ENGINEERING AND
SCIENCE TECHNOLOGY PROGRAMS**

These programs offered by Lincoln College present a variety of interdisciplinary combinations of the Engineering Technology Programs and the Science Programs (chemistry, physics, and mathematics). They have been developed to meet the need for technologists in the areas of ecology, bio-electronic devices, computer systems, and other technological applications requiring an expertise in several of the academic disciplines.

This demand for multi-skilled technologists reflects the increased reliance of society on the science and engineering technologist to help solve its growth problems. Opportunities are also developing in highly interdisciplinary fields such as ocean engineering, bioengineering, environmental science, and public health.

The programs are designed to offer the student the opportunity to prepare to meet the charge of interfacing technology and society. The engineering technology student not only learns about related disciplines but also becomes oriented in the disciplines to which his or her technological skills will be applied. A program of concentrated study in chemistry and physics or mathematics and physics is offered to the science technology student.

Interdisciplinary Engineering and Science Technology programs offered to Lincoln College students are:

Associate in Science Degree

Chemical-Physical Technology	page 90
Mathematical-Physical Technology	page 92

Associate in Engineering Degree

Computer Technology	page 93
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Bachelor of Engineering Technology Degree

Mechanical-Structural Engineering Technology	page 96
Computer Technology	page 94

Chemical-Physical Technology	Major Code 071
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Leading to the Degree of Associate in Science

The program in Chemical-Physical Technology offers the student the opportunity to prepare to assume responsibilities related to the analysis, synthesis, and production of products involving chemical as well as physical changes. The curriculum provides both theoretical and laboratory training in the traditional branches of chem-

istry, and also includes modern instrumental, radiochemistry, and nuclear technology. It provides broad rather than specialized training so as to have applicability in many chemistry-related fields. Employment opportunities are in manufacturing and pharmaceutical plants producing drugs, oils, synthetics, and plastics, and in private and industrial research laboratories concerned with the development of processes, by-products, and new knowledge. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year				
Course Number		Course		Q.H.
10.307,	10.308	College Algebra & Trigonometry I, II		8
	10.320	Calculus I		4
11.304,	11.305,	11.306	General Physics I, II, III	6
12.444,	12.445,	12.446	General Chemistry I, II, III	9
Second Year				
10.321,	10.322,	10.323	Calculus II, III, IV	6
12.421,	12.422,	12.423	Analytical Chemistry I, II, III	9
30.305,	30.306		English I, II	6
		94.404	Technical Communications	3
Third Year				
12.431,	12.432,	12.433	Organic Chemistry I, II, III	12
11.331,	11.332,	11.333	Modern Physics I, II, III	6
09.351,	09.352,	09.353	Principles of Computer Programming I, II, III	6
Fourth Year				
12.441,	12.442,	12.443	Physical Chemistry I, II, III	9
12.451,	12.452,	12.453	Instrumental Analysis I, II, Radiochemistry	9
04.381,	04.382,	04.383	Nuclear Technology I, II, III	6
			Elective I, II, III	6
Total A.S. degree				105

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Mathematical-Physical Technology**Major Code 072***Leading to the Degree of Associate in Science*

The program in Mathematical-Physical Technology offers the student the opportunity to establish a firm background in the concepts of physics and mathematics with sufficient chemistry to allow effective communication between technologist and professional. The intensity of courses introduces theoretical depth for concept development but places emphasis at the level of application and performance.

Graduates may serve as high-level technicians and laboratory assistants in such fields as environmental and space science. Working with the professional engineer or scientist, they may assist in performing intricate and detailed experiments; collect, organize, and reduce technical data to manageable form for analysis; or perform investigations requiring mathematical and scientific backgrounds. Opportunities exist in the wide spectrum of research and development organizations which deal in the physical, mathematical, and engineering sciences. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year					
Course Number			Course		Q.H.
10.307,	10.308		College Algebra & Trigonometry I, II		8
	10.320		Calculus I		4
11.317,	11.318,	11.319	Physics I, II, III		12
Second Year					
10.321,	10.322,	10.323	Calculus II, III, IV		6
11.321,	11.322,	11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices		6
12.444,	12.445,	12.446	General Chemistry I, II, III		9
30.305,	30.306		English I, II,		6
	93.404		Technical Communications		3
Third Year					
09.351,	09.352,	09.353	Principles of Computer Programming I, II, III		6
10.324,	10.325,	10.326	Differential Equations I, II, III		6
03.320	03.321,	03.322	Electricity & Electronics I, II, III		6
			Technical Elective I, II, III		6
Fourth Year					
10.351,	10.352,	10.353	Advanced Mathematics I, II, III		6
11.331,	11.332,	11.333	Modern Physics I, II, III		6
11.373,	11.374,	03.323	Physics Laboratory I, II, Electronics Lab.		6
			Elective I, II, III		6
Total A.S. degree					102

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Computer Technology**Major Code 036***Leading to the degree of Associate in Engineering*

The Computer Technology program offers students the opportunity to provide themselves with the mathematical and technological background for understanding both the hardware and software aspects of computer systems and so will be prepared as: a) programmers who translate engineering, scientific, and business concepts into meaningful form for the computer; b) engineering technicians concerned with the development, specification, production, and operation of computer hardware; and c) applications technicians dealing with the interface of the computer with industrial process and control systems or data acquisition, reduction, and display systems. Job opportunities will also depend on the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

10.321, 10.322, 10.323	Calculus II, III, IV	6
09.307, 09.308, 09.309	Electrical & Electronic Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
30.305, 30.306, 93.404	English I, II, Technical Communications	9

Third Year

03.500, 03.501, 03.502	Microprocessor Hardware I, II, III	6
09.390,	Information Systems I	4
09.391, 09.392	Information Systems II, III	4
03.301, 03.302, 03.303	Circuit Theory I, II, III	6
11.320	Semiconductor Physics and Devices	4

Fourth Year

03.311, 03.312, 03.313	Electronics I, II, III	12
03.323	Electronic Lab.	2
09.376, 09.377, 09.378	Micro/Mini Software I, II, III	6
	Liberal Arts Elective	3

Total A.E. degree **98**

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Computer Technology**Major Code 037***Leading to the degree of Bachelor of Engineering Technology*

The Computer Technology program offers students the opportunity to prepare themselves to be knowledgeable in both hardware and software. The balance of hardware and software courses combined with hands-on laboratory experience provides the student with the opportunity to develop the skill for interfacing the computer with process plants or machinery. Other employment possibilities exist in programming the computer for engineering, scientific, and business applications; designing, engineering, and testing computers; and interfacing computers with various types of equipment for automated drafting, data collection, and display. Job opportunities will also depend upon the economy and the individual's abilities.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

10.321, 10.322, 10.323	Calculus II, III, IV	6
09.307, 09.308, 09.309	Electrical & Electronic Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
30.305, 30.306, 93.404	English I, II, Technical Communications	9

Third Year

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.390	Information Systems I	4
09.391, 09.392	Information Systems, II, III	4
11.320	Semiconductor Physics and Devices	4
09.383, 09.384	Computer Analysis I, II	4
05.590, 05.591	Probability and Statistics	4

Fourth Year

03.311, 03.312, 03.313	Electronics I, II, III	12
03.500, 03.501, 03.502	Microprocessor Hardware I, II, III	6
09.365, 09.366	Modern Programming Techniques I, II	4
03.323	Electronic Lab.	2

Fifth Year

03.327	Advanced Electronic Lab. I	2
03.391, 03.392	Computer Technology Lab. I	4
09.376, 09.377, 09.378	Micro/Mini Software I, II, III	6
23.301, 23.302, 23.303	History of Civilization I, II, III	9
	Technical Electives	6

Sixth Year

09.380,	09.381,	09.382	Computer Peripherals I, II, III	6
09.370,	09.371,	09.372	Programming Languages I, II, III	6
03.387,	03.388,	03.389	Integrated Circuits I, II, III	6
39.301,	39.302,	39.303	Economic Principles and Problems I, II, III	9

Seventh Year

09.386,	09.387,	09.388	Software Applications Seminar I, II, III	6
09.500,	09.501,	09.502	Data Communications I, II, II	6
19.301,	19.302,	19.303	Psychology I, II, III	9
			Technical Elective	6

Total B.E.T. degree 182

Suggested Electives

				Q.H.
03.314,	03.315,	03.316	Pulse & Digital Circuits I, II, III	6
03.371,	03.372,	03.373	Analog Digital & Hybrid Computers I, II, III	6
03.374,	03.375,	03.376	Digital Systems I, II, III (Prereq. 03.316)	6
10.351,	10.352,	10.353	Advanced Mathematics I, II, III	6
10.324,	10.325,	10.326	Differential Equations I, II, III	6
09.393,	09.394,	09.395	Computer Graphics I, II, III	6
09.396,	09.397,	09.398	Operating Systems I, II, III	6
			Honors Project I, II, III	6
49.380			Introduction to Operations Research	3
	49.381		Operations Research Applications	3
49.364			Data Systems Administration	3
	49.365,	49.366	Business Data Processing Applications I, II	6
49.333,	49.334		Minicomputer Systems in Business I, II	6
49.330			RPG Programming	3
49.337			Privacy & Security	3
49.370			Government Data Processing Applications	3
49.369			Auditing Data Processing Applications	3
49.371			Retail Marketing & Distribution Data Processing Applications I, II	3
49.372			Banking Data Processing Applications I, II	3
49.374			EDP in Property & Casualty Insurance	3
49.373			Information Processing in Medicine	3

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

Mechanical-Structural Engineering Technology
Major Code 015

(Accredited by the Engineers' Council for Professional Development)

Leading to the Degree of Bachelor of Engineering Technology

The program in Mechanical-Structural Engineering Technology is interdisciplinary in that it provides the opportunity for students to prepare themselves to assume responsibilities related to both the planning and construction of relatively static structures such as buildings, bridges, docks, etc., and also the design and production of dynamic machine tools, machinery, and other mechanical devices. The mechanical and structural content is integrated so as to be complementary and to provide a broad base for design problems of great variety. Employment opportunities lie in the architectural, construction, civil, and mechanical professions and companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

First Year				
Course Number		Course		Q.H.
10.307,	10.308		College Algebra and Trigonometry I, II	8
		10.320	Calculus I	4
09.311,	09.312,	09.313	Engineering Graphics I, II, III	6
30.305,	30.306		English I, II	6
		93.404	Technical Communications	3
Second Year				
10.321,	10.322,	10.323	Calculus II, III, IV	6
11.317,	11.318,	11.319	Physics I, II, III	12
09.351,	09.352,	09.353	Principles of Computer Programming	6
Third Year				
02.501			Statics	2
	02.502		Structural Mechanics	2
		02.503	Strength of Materials I	2
01.301,	01.302,	01.303	Surveying I, II, III	6
09.314			Engineering Design I	2
	02.526		Mechanical Design I	2
		05.580	Engineering Economics I	2
23.301,	23.302,	23.303	History of Civilization I, II, III	9
Fourth Year				
02.504			Particle Dynamics	2
	02.505		Kinematics	2
		02.506	Body Dynamics	2
01.341,	01.342,	01.343	Fluid Mechanics I, II, III	6
02.541			Mechanical Behavior of Materials	2
	02.542		Physical Behavior of Materials	2
		02.543	Materials and Processes	2
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	9

Fifth Year

02.507			Strength of Materials	2
	02.508		Stress Analysis	2
		02.509	Deflection Analysis	2
01.321,	01.322,	01.323	Introduction to Structures I, II, III	6
02.531			Measurement and Analysis Laboratory	2
	02.532,	02.533	Mechanical Technology Laboratory I, II	4
()	()	()	*Technical Elective	6

Sixth Year

01.324,	01.325,	01.326	Structural Analysis I, II, III	6
01.331,	01.332,	01.333	Steel Design I, II, III	6
()	()	()	*Technical Elective	6
()	()	()	*Technical Elective	6

Seventh Year

01.371,	01.372,	01.373	Reinforced Concrete Design I, II, III	6
02.527,	02.528,	02.529	Mechanical Design II, III, IV	6
19.301,	19.302,	19.303	Psychology I, II, III	9
()	()	()	*Technical Elective I, II, III	6

Total B.E.T. degree 180

Suggested Electives

01.361,	01.362,	01.363	Materials and Soil Mechanics I, II, III	6
02.337,	02.338,	02.339	Mechanical Vibrations I, II, III	6
01.327,	01.328,	01.329	Advanced Structural Analysis I, II, III	6
01.334,	01.335,	01.336	Advanced Structural Design I, II, III	6
02.351,	02.352,	02.353	Thermodynamics I, II, III	6
02.510			Advanced Stress Analysis	2
	02.511,	02.512	Experimental Stress Analysis	4
02.344,	02.345,	02.346	Applied Metallurgy	6

Elective courses for which proper preparation exists may be chosen from within or outside of the Mechanical-Structural Engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology Program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

* Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Academic Standing Committee.
10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.



description of courses

On the pages which follow is a numerical and descriptive listing of courses offered in the several curricula of Lincoln College. Although not all courses are offered every year, all will be offered during the normal period of each student's curriculum. The term "prerequisite" indicates a course that must be taken before undertaking the advanced course to which it applies.

A "quarter hour" equals approximately three clock hours of work (ordinarily, one hour of class and two hours of preparation a week for a quarter of 12 weeks' duration). Laboratory and drawing courses normally require fewer hours of outside preparation and therefore carry less credit than lecture courses.

Abbreviations

prereq.—prerequisite
coreq.—corequisite
cl.—class hours

lab.—laboratory hours
q.h.—quarter hours

Policy on Changes of Program

Lincoln College reserves the right to cancel, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time relative to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

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CIVIL ENGINEERING TECHNOLOGY

01.301 Surveying I (2 cl., 2 q.h.)

Surveying principles; theory of measurements; basic traverse computation and adjustments and inverse leveling. *Prereq.* 10.308.

01.302 Surveying II (2 cl., 2 q.h.)

Stadia principles and topography; simple and compound curves; area calculations. *Prereq.* 01.301.

01.303 Surveying III (2 cl., 2 q.h.)

Vertical curves, earthwork computations; solution of the mass diagram. *Prereq.* 01.302.

01.304 Advanced Surveying (2 cl., 2 lab., 2 q.h.)

Introduction to practical astronomy as applied to the surveying practice for determination of observers position, including basic spherical trigonometry. *Prereq.* 01.303.

01.305 Advanced Surveying II (1 cl., 2 lab., 2 q.h.)

Introduction to geodetic surveying including precise leveling, triangulation, EDM equipment, and base line measurements. *Prereq.* 01.304.

01.306 Advanced Surveying III (1 cl., 2 lab., 2 q.h.)

Basic principles of photogrammetry and field control for map making from aerial photography. Map projections and the Massachusetts Coordinate System. *Prereq.* 01.305.

01.307 Legal Aspects of Surveying I (2 cl., 2 q.h.)

Registry of deeds and probate; ownership of land, deeds; descriptions and qualifying expressions; monument rule; metes and bounds; plans; apportionment. *Prereq.* 01.303.

01.308 Legal Aspects of Surveying II (2 cl., 2 q.h.)

Adverse possession; easement; title insurance; Massachusetts land court; expert witness. *Prereq.* 01.307.

01.310 Surveying Laboratory (2 cl., 2 q.h.)

An outdoor course in use of level, level circuit, vertical control, use of the transit, taping exercises, closed traverse—transit-tape, horizontal control, topography—stadia and plane table, layout problems, horizontal and vertical curves, spiral easements. *Prereq.* 01.303 (Summer Session).

01.311 Highway Engineering I (2 cl., 2 q.h.)

Engineering considerations in the planning and construction of modern highways and highway routing. *Prereq.* 01.301.

01.312 Highway Engineering II (2 cl., 2 q.h.)

Rates of grade, superelevation, flexible and rigid pavements, and other features of highway design. *Prereq.* 01.311.

01.313 Highway Engineering III (2 cl., 1 q.h.)

Traffic flow and traffic control; computer applications to transportation problems. *Prereq.* 01.312.

01.314 Surveying Practice I (1 cl., 2 lab., 2 q.h.)

Computing and balancing a control traverse; calculating exact property lines; vertical control survey; plotting from topographic field notes. *Prereq.* 01.303.

01.315 Surveying Practice II (1 cl., 2 lab., 2 q.h.)

Scale drawing of the proposed subdivision; making calculations of the subdivision required by the land court; street profiles showing grades; drainage study. *Prereq.* 01.314.

01.316 Land Use Planning (2 cl., 2 q.h.)

Environmental, sociological, economic aspects and traditional basis for land use planning. Objectives, content, form, and preparation of plan. Community and public facilities transportation; environmental impact and plan implementation. *Prereq.* 09.313 or equiv.

01.321 Introduction to Structures I (1 cl., 2 lab., 2 q.h.)

Framing plans and details for steel structures. *Prereq.* 09.313 and 02.303.

01.322 Introduction to Structures II (1 cl., 2 lab., 2 q.h.)

Structural shop drafting and the evaluation of load capacities of rivets, welds, and bolts for structural connections using the AISC code. *Prereq.* 01.321.

01.323 Introduction to Structures III (1 cl., 2 lab., 2 q.h.)

Design and detailing of joints including standard connections, seats, and brackets. *Prereq.* 01.322.

01.324 Structural Analysis I (2 cl., 2 q.h.)

Reactions, shears, bending moments, and forces developed by loads on beams and trusses; analytical and graphical methods. *Prereq.* 02.509.

01.325 Structural Analysis II (2 cl., 2 q.h.)

Influence lines for beams, girders, and trusses; solutions for forces from moving load system on statically determinate structures. *Prereq.* 01.324.

01.326 Structural Analysis III (2 cl., 2 q.h.)

Introduction to classical methods of deflection solutions of beams and trusses. Methods of solving statically indeterminate structures. *Prereq.* 01.325.

01.327 Advanced Structural Analysis I (2 cl., 2 q.h.)

Analysis of indeterminacy and instability; analysis of statically indeterminate structures using Castigliano, virtual work, methods of deflections, and the neutral point methods. *Prereq.* 01.326.

01.328 Advanced Structural Analysis II (2 cl., 2 q.h.)

Analysis of statically indeterminate structures using the column analogy, moment, area, elastic weights, and conjugate structures. *Prereq.* 01.327.

01.329 Advanced Structural Analysis III (2 cl., 2 q.h.)

Analysis of statically indeterminate structures using Williot-Mohr, slope deflection, and moment distribution. *Prereq.* 01.328.

01.331 Steel Design I (2 cl., 2 q.h.)

Design of steel members in structural frames; tension, compression, bending, and eccentrically loaded members. *Prereq.* 01.323 and 02.509.

01.332 Steel Design II (2 cl., 2 q.h.)

Design of plate girders, highway bridge decks, and roof-framing systems. *Prereq.* 01.331.

01.333 Steel Design III (2 cl., 2 q.h.)

Composite design in bridges and buildings; introduction to plastic design methods in steel. *Prereq.* 01.332.

01.334 Advanced Structural Design I (2 cl., 2 q.h.)

Design of continuous frames in structural steel, moment resistant connections, and column bases. *Prereq.* 01.326, 01.333, 01.373.

01.335 Advanced Structural Design II (2 cl., 2 q.h.)

Design of continuous frames in reinforced concrete; introduction to prestressed concrete member design. *Prereq.* 01.334.

01.336 Advanced Structural Design III (2 cl., 2 q.h.)

Design of foundations for structures; spread footings, combined footings, mats and pile foundations. *Prereq.* 01.335.

01.341 Fluid Mechanics I (2 cl., 2 q.h.)

Hydrostatics; principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension. *Prereq.* 02.502.

01.342 Fluid Mechanics II (2 cl., 2 q.h.)

Fluid dynamics; kinematics of flow; continuity, momentum, and energy equations; orifices; pi theorem; laminar and turbulent flow. *Prereq.* 01.341.

01.343 Fluid Mechanics III (2 cl., 2 q.h.)

Flow in closed conduits using Moody diagram; empirical formulae for closed conduit flow; minor losses; compound pipe systems; open channel flow and Manning formula; specific energy and stage relationships; fluid measurement systems. *Prereq.* 01.342.

01.351 Environmental Engineering I (2 cl., 2 q.h.)

Principles of water supply engineering; population forecasting; quality and quantity of water for various uses; water treatment processes. *Prereq.* 01.343 and 12.446 or 12.309.

01.352 Environmental Engineering II (2 cl., 2 q.h.)

Collection and disposal of wastewater and storm water; modern methods of treatment and wastewater plant operation. *Prereq.* 01.351.

01.353 Environmental Engineering III (1 cl., 2 lab., 2 q.h.)

Layout and design of water treatment and sewage treatment plants. Instrumentation and electrical equipment. *Prereq.* 01.352.

01.361 Materials and Soil Mechanics I

Physical properties of Portland cement, aggregates, mixing water, and admixtures; proportioning of batches; mixing, placing, and finishing of concrete; bituminous materials. *Prereq.* 02.503.

01.362 Materials and Soil Mechanics II

Index properties, soil moisture, and structure; compressibility, theory of consolidation. *Prereq.* 01.361.

01.363 Materials and Soil Mechanics III

Shearing strength of soils, stress analysis, settlement calculations; lateral earth pressures, bearing capacity of shallow footings; soil compaction, stabilization and site investigation. *Prereq.* 01.362.

01.364 Materials & Soil Mechanics Lab. (2 cl., 2 q.h.)

Grain size analysis; variables in concrete mix; bituminous testing, specific gravity—CBR optimum moisture; direct shear, consolidation; seepage and flow nets; unconfined compression test. *Prereq.* 01.363.

01.371 Reinforced-Concrete Design I (2 cl., 2 q.h.)

Design of bending members in reinforced concrete, using elastic and ultimate-strength theories. *Prereq.* 02.509.

01.372 Reinforced-Concrete Design II (2 cl., 2 q.h.)

Design of axially and eccentrically loaded columns by elastic and ultimate strength principles. *Prereq. 01.371.*

01.373 Reinforced-Concrete Design III (2 cl., 2 q.h.)

Reinforced-concrete design of basic structures including consideration of continuity. *Prereq. 01.372.*

01.380 Environmental Lab. I (2½ lab., 2 q.h.)

Methods and techniques for the examination of water. Treatment efficiency is included for various types of water treatment. *Prereq. 12.446 or equiv.*

01.381 Environmental Lab. II (2½., 2 q.h.)

Methods and techniques for the examination of wastewater and industrial waste discharges. Both chemical and bacteriological analysis are included. *Prereq. 01.380.*

01.382 Environmental Lab. III (2½ lab., 2 q.h.)

Advanced methods of measuring impurities in air, water, and solid waste discharges. *Prereq. 01.382.*

01.390 Construction Administration (2 cl., 2 q.h.)

Contract, specifications, and bidding procedures; estimating and scheduling, including the critical path method; discussion of personnel administration and union negotiation. *Prereq. none.*

01.393 Architectural Design I (2 cl., 2 q.h.)

Basic architectural design concepts; proportion, scale, form, massing, color, texture, lighting; lecture and drawings. *Prereq. none.*

01.394 Architectural Design II (2 cl., 2 q.h.)

Orientation of structures; site organization; selection of building materials; consideration of the building process. *Prereq. 01.393.*

01.395 Architectural Design III (2 cl., 2 q.h.)

Basic architectural design projects assigned by the instructor. *Prereq. 01.394.*

01.401 Technology of Modern Architecture I (2 cl., 2 q.h.)

General background of architectural styles both historical and contemporary, with emphasis on engineering design aspects and construction procedures of various types of buildings. *Prereq. none.*

01.402 Technology of Modern Architecture II (2 cl., 2 q.h.)

Contemporary architecture, emphasizing the engineering design aspects and construction procedures required for modern buildings. *Prereq. none.*

01.598 Special Problems in Civil Engineering Technology (2 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq. Consent of department chairman.*

01.599 Special Problems in Civil Engineering Technology (4 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq. Consent of department chairman.*

MECHANICAL ENGINEERING TECHNOLOGY

02.337 Mechanical Vibrations I (2 cl., 2 q.h.)

Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods); natural frequencies; damped free and forced vibration; impedance and mobility. *Prereq.* 02.306.

02.338 Mechanical Vibrations II (2 cl., 2 q.h.)

Systems with more than one degree of freedom; influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber. *Prereq.* 02.337.

02.339 Mechanical Vibrations III (2 cl., 2 q.h.)

Natural frequencies by Rayleigh methods and Holzer methods for multi-degree of freedom; application problems with combined rotation and translation; Laplace transforms and electro-mechanical analogs. *Prereq.* 02.338.

02.344 Applied Metallurgy I (1 cl., 1 lab., 2 q.h.)

Lectures: structures of metals, imperfections, phase diagrams, effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipitation, diffusion), strengthening mechanisms, mechanical properties of non-ferrous metals.

Laboratory: experiments in preparation of samples, selection, polishing, and etching; examination of non-ferrous metals; use of the microscope; linear analysis; construction of cooling curves and simple binary phase diagrams. *Prereq.* 02.542.

02.345 Applied Metallurgy II (1 cl., 1 lab., 2 q.h.)

Lectures: mechanical properties of ferrous metals, the iron carbon diagram, high temperature alloys, hardening methods, impact tests, effects of environment on metals.

Laboratory: experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. *Prereq.* 02.344.

02.346 Applied Metallurgy III (1 cl., 1 lab., 2 q.h.)

Lectures: manufacturing processes, methods of fabrication; limitations on the use of different materials and processes; casting, welding, cutting, drawing, powder metallurgy.

Laboratory: experiments in cold rolling, swagging, drawing of non-ferrous metals and the analysis of the results; tension, shear, fatigue, and machinability tests on ferrous metals. *Prereq.* 02.345.

02.347 Principles of Aerodynamics (4 cl., 4 q.h.)

This is a first course in aerodynamics covering the fundamentals of theory and application. Material presented includes: properties of air, fluid flow principles, lift, drag, air foil, and wing theory; auxiliary lift devices; stability and control; and flight vehicle performance. *Prereq.* 01.343.

02.351 Thermodynamics I (2 cl., 2 q.h.)

General theory of energy and heat transfer; laws of thermodynamics; basic equations of energy transformation; thermodynamic properties and behavior of perfect gases; introduction to the Carnot cycle. *Prereq.* 11.318.

02.352 Thermodynamics II (2 cl., 2 q.h.)

Concepts of availability of energy steady and non-flow processes; theory of fluid flow through orifices and nozzles, and compression of gases; thermodynamic analysis of internal combustion engines including the Otto and Diesel Cycles. *Prereq.* 02.351.

02.353 Thermodynamics III (2 cl., 2 q.h.)

Combustion of fossil fuels for their energy transfer; thermodynamic properties and processes of liquids and vapors, tables and Mollier diagram; theory of vapor power cycles; analysis of external combustion engines including the Rankine and Brayton Cycles. *Prereq.* 02.352.

02.401 Man and Materials (2 cl., 2 q.h.)

(See General Interest Courses, pages 163-164.)

02.411 Mechanics A (4 cl., 4 q.h.)

(Day Curriculum)

Forces, moments, couples, statics of particles and rigid bodies in two and three dimensions; distributed forces—external and internal; first moments and centroids; analysis of structure—trusses, frames, and machines. *Prereq.* 10.320, 11.317.

02.412 Mechanics B (4 cl., 4 q.h.)

(Day Curriculum)

Friction, second moments, and virtual work; kinematics of particles—rectilinear and curvilinear motion of dynamic particles—force, mass and acceleration, work and energy. *Prereq.* 02.411.

02.413 Mechanics C (4 cl., 4 q.h.)

(Day Curriculum)

Impulse and momentum of particles; kinematics and dynamics of rigid bodies—force, mass, and acceleration; dynamics of rigid bodies—work and energy, impulse and momentum; introduction to mechanical vibration. *Prereq.* 02.412.

02.414 Stress Analysis A (4 cl., 4 q.h.)

(Day Curriculum)

Stress and deformation; mechanical properties of materials; allowable stresses and factor of safety; axially loaded indeterminate members; effects of temperature on stresses and strains; thin cylinders and spheres; riveted and welded joints; shear and bending moment in beams; flexural and transverse shearing stresses in beams; design of beams. *Prereq.* 02.411.

02.415 Stress Analysis B (4 cl., 4 q.h.)

(Day Curriculum)

Determinate and indeterminate beam deflections and reactions by integration and area moment methods. Torsional stresses and strains; power transmission; eccentric loads on struts, beams, riveted and welded joints; combined stresses; principal stresses; Mohr's circle; theories of failure. *Prereq.* 02.414.

02.416 Stress Analysis C (4 cl., 4 q.h.)

(Day Curriculum)

Curved beams; non-symmetrical bending of beams; short-center and shear stresses on thin sections; composite beams. Columns; energy absorption and resilience; inertial stresses impact loading; deflection of beams by energy methods. Bolted fastenings. *Prereq.* 02.415.

- 02.417 Mechanical Design A** (4 cl., 4 q.h.) (Day Curriculum)
Introduction; properties and selection of materials; manufacturing considerations; stress concentrations; strength under combined stresses; theories of failure; impact; and fluctuating and repeated loads. Stresses, deformation and design of springs. Preloading of bolted joints. Design ball and journal bearings, kinematics of gear trains. *Prereq.* 02.415.
- 02.418 Mechanical Design B** (2 cl., 2 q.h.) (Day Curriculum)
Stresses and power transmission of spur, bevel, and worm gear; screws for power transmission. Design of shafts, brakes, clutches, design project. *Prereq.* 02.417.
- 02.419 Mechanics** (4 cl., 4 q.h.) (Day Curriculum)
A mechanics course for non-mechanical students. *Prereq.* 10.320, 11.317.
- 02.421 Thermodynamics A** (4 cl., 4 q.h.) (Day Curriculum)
General theory of heat and matter; laws of thermodynamics; energy-transformation principles and availability of energy; properties and processes for pure substances and ideal gases. Thermodynamic properties and processes of liquids and vapors; tables and charts; mixtures of fluids; vapor cycles. *Prereq.* 11.318.
- 02.422 Thermodynamics B** (4 cl., 4 q.h.) (Day Curriculum)
Theory of vapor engines and analysis of types of actual engines using compression of gases and vapors; internal combustion engines. Theory of gas and vapor flow through orifices and nozzles. Design and performance of steam and gas turbines; spark-ignition and compression-ignition engine design and performance. Fan performance. *Prereq.* 02.421.
- 02.423 Thermodynamics C** (4 cl., 4 q.h.) (Day Curriculum)
Air conditioning principles including psychometrics and heat pumps. Calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices. Principles of gas compression; analysis of vapor compression; refrigeration systems; low temperature refrigeration cycles; and absorption refrigeration systems. *Prereq.* 02.422.
- 02.424 Thermodynamics D** (2 cl., 2 q.h.) (Day Curriculum)
The primary modes of heat transfer; thermal conductance/resistance concept; thermal-electrical analog; combined heat transfer mechanisms; basic equations of conduction; thermal conductivity; analytical solutions of various steady state conduction problems. *Prereq.* 02.422.
- 02.425 Thermodynamics E** (4 cl., 4 q.h.) (Day Curriculum)
Dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; log-mean temperatures differences; overall heat transfer coefficients; applications to heat exchangers. Black body radiation; Kirchoff's Law; emissivity and absorptivity; radiation between simple bodies. Graphical and numerical methods applied to steady state; conduction problems; radiation and convection effects; transient heat transfer; numerical methods applied to transient problems; heat transfer engineering problems. *Prereq.* 02.424.
- 02.431 Materials A** (4 cl., 4 q.h.) (Day Curriculum)
Lectures on: fundamental metallic structures; general metallurgical information covering theoretical aspects of properties; testing and failure of metals; supplemented

by visual aids. Lectures on: alloying and hardening of metals; refinement of metals; equilibrium diagrams; characteristics of engineering metals; principles of metal fabrication. *Prereq. none.*

02.432 Materials B (4 cl., 4 q.h.) (Day Curriculum)

Lectures on: inorganic materials, i.e., polymers, glasses, ceramics, cements, wood, and materials having important electrical and magnetic properties; also a summary of the most up-to-date applications for the fabrication and uses of both metals and non-metals. Structures of metals; imperfections; phase diagrams; effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipitation, diffusion); strengthening mechanisms; mechanical properties of non-ferrous metals.

Laboratory: experiments in preparation of samples, selection, polishing, and etching; examination of non-ferrous metals; use of the microscope; linear analysis; construction of cooling curves; and simple binary phase diagrams. *Prereq. 02.431.*

02.433 Applied Metallurgy (4 cl., 4 q.h.) (Day Curriculum)

Lectures on: mechanical properties of ferrous metals, the iron carbon diagram, high temperature alloys, hardening methods, impact tests, effects of environment on metals; manufacturing processes; methods of fabrication; limitations on the use of different materials and processes; casting, welding, cutting, drawing, powder metallurgy.

Laboratory: experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. Experiments in cold rolling, swaging, drawing of non-ferrous metals and the analysis of the results. Tension, shear, fatigue, and machinability tests on ferrous metals. *Prereq. 02.432*

02.441 Fluid Mechanics A (4 cl., 4 q.h.) (Day Curriculum)

Hydrostatics, principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension. Fluid flow in pipes under pressure; fluid energy, power and friction loss; Bernoulli's Theorem; flow measurement. *Prereq. 02.412.*

02.442 Fluid Mechanics B (2 cl., 2 q.h.) (Day Curriculum)

Pipe networks and reservoir systems; flow in open channels; uniform flow; energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow; non-uniform flow; accelerated and retarded flow; hydraulic jump and waves. *Prereq. 02.441.*

02.451 Mechanical Vibrations (4 cl., 4 q.h.) (Day Curriculum)

Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods); natural frequencies; damped free and forced vibration; impedance and mobility; systems with more than one degree of freedom; influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber. *Prereq. 02.413.*

02.452 Experimental Stress Analysis (4 cl., 4 q.h.) (Day Curriculum)

Theory and experimentation showing the application of extensometers and electrical strain gauges and as transducers in the field of experimental stress and strain analysis. Theory and laboratory practice on photoelastic methods as applied to classical model analysis and modern coating analysis. *Prereq. 02.415.*

02.461 Machine Shop (2 cl., 3 lab., 4 q.h.) (Day Curriculum)
Introduction to study of machines for metal processing, cutting tools, and fluids; machinability; automatic machinery. *Prereq. none.*

02.462 Mechanical Technology Laboratory I (3 lab., 2 q.h.) (Day Curriculum)
Experimental procedures for the collection and analysis of data by graphical and numerical methods including computer applications, report writing that draws conclusions which are relative to accuracy, precision, true values, and measured values as they are related to basic mechanical measuring instruments for length, area, volume, specific gravity, pressure, temperature, and time as these parameters are utilized in making mechanical measurements. *Prereq. 02.441.*

02.464 Mechanical Technology Laboratory III (3 lab., 2 q.h.) (Day Curriculum)
Experimental procedures to determine the physical properties of incompressible fluids, measure the flow rates and velocities utilizing pitot tubes, orifice plates, venturi meter, and weirs flow meters, U tube differential manometers, and piezometers as the fluid flows through open channels, partially filled conduits, conduits under pressure, pipe networks, turbines, and pumps.
Experimental procedures to examine the operating characteristics and efficiencies of internal combustion engines, brake horsepower, indicated horsepower, friction horsepower, mean effective pressure, fuel consumption, torque, ignition timing, manifold pressure, and compression ratios and internal engines as energy conversion systems. *Prereq. 02.463.*

02.466 Heat Technology Laboratory II (3 lab., 2 q.h.) (Day Curriculum)
Experimental procedures of a project nature to examine refrigeration, air conditioning, and heating pump cycles as they relate to psychometrics, heat transfer, heating and cooling loads, environmental factors, and to determine the efficiencies of these systems under actual operating conditions. Experimental procedures relate actual operating equipment to actual field conditions. *Prereq. 02.465, 02.424, or concurrently.*

02.467 Project Laboratory (6 cl., 4 q.h.) (Day Curriculum)
A project of analytical, design, or experimental nature. Must be approved by student's faculty adviser. A formal report must be submitted. *Prereq. 02.464, 02.466.*

02.468 Mechanical Technology Laboratory II (3 lab., 2 q.h.) (Day Curriculum)
Experimental procedures to determine mechanical properties of materials under tensile, compressive, torsional, direct shear, flexural, impact, fatigue, and creep loading conditions as they are affected by environmental conditions that are normal and abnormal; also as they are affected by homogeneity, non-homogeneity, isotropy, and non-isotropy. *Prereq. 02.462, 02.415, 02.431.*

02.469 Heat Technology Laboratory I (3 lab., 2 q.h.) (Day Curriculum)
Experimental procedures to examine the flow of compressible fluids and steam; examine the energy conversion of a fuel into a working substance and the related heat transfer mechanisms; also the efficiencies of generators, engines, and compressors. *Prereq. 02.422 or concurrently.*

02.499 Special Problems in Mechanical Engineering Technology (4 q.h.)
Theoretical or experimental work under individual faculty supervision. *Prereq. Consent of department chairman.*

02.501 Statics (2 cl., 2 q.h.)

Forces; moments; couples; free-body diagrams; statics of particles and rigid bodies in two and three dimensions. *Prereq.* 10.320, 11.317.

02.502 Structural Mechanics (2 cl., 2 q.h.)

Distributed forces; first moments and centroids; analysis of trusses, frames and machines. *Prereq.* 02.501.

02.503 Strength of Materials I (2 cl., 2 q.h.)

Axially-loaded members; stress and strain, allowable stresses, factor of safety, temperature effects, indeterminate members; thin-walled pressure vessels; centric loading of bolted and welded connection. *Prereq.* 02.502.

02.504 Particle Dynamics (2 cl., 2 q.h.)

Dynamics of particles, impulse and momentum, work and energy. *Prereq.* 02.501.

02.505 Kinematics of Bodies (2 cl., 2 q.h.)

Kinematics of rigid bodies (Relative Motion); second moments of areas and masses. *Prereq.* 02.504.

02.506 Body Dynamics (2 cl., 2 q.h.)

Dynamics of rigid bodies; impulse and momentum, work and energy. *Prereq.* 02.505.

02.507 Strength of Materials II (2 cl., 2 q.h.)

Shear and moment in beams; eccentrically loaded connections; flexural and transverse shearing stresses in beams. *Prereq.* 02.503.

02.508 Stress Analysis (2 cl., 2 q.h.)

Torsional stresses and strains; point stress, principle stress, Mohr's circle; combined stress. *Prereq.* 02.507.

02.509 Deflection Analysis (2 cl., 2 q.h.)

Determinate and indeterminate beam deflections and reactions; by integration, area moment and numerical methods; buckling of columns. *Prereq.* 02.508.

02.510 Advanced Stress Analysis (2 cl., 2 q.h.)

Curved beams; non-symmetrical bending of beams; shear-center and shear stresses on thin sections; beam deflections by energy methods. *Prereq.* 02.509.

02.511 Experimental Stress Analysis I (2 cl., 2 q.h.)

Theory and application of electrical strain gages; brittle coating analysis. *Prereq.* 02.508.

02.512 Experimental Stress Analysis II (2 cl., 2 q.h.)

Theory and application of photoelastic analysis by models and coatings; Moiré method of strain analysis. *Prereq.* 02.508.

02.526 Mechanical Design I (2 cl., 2 q.h.)

Introduction to Mechanical Design, the design process, design factors, creativity, optimization, human factors, value engineering. These principles discussed and developed in an introductory manner through simple design projects. *Prereq.* 09.313.

02.527 Mechanical Design II (2 cl., q.h.)

Principles of design, properties and selection of materials; stress concentrations; strength under combined stresses; theories of failure; impact and fluctuating and repeated loads. *Prereq.* 02.506, 02.509.

02.528 Mechanical Design III (2 cl., 2 q.h.)

Stresses; deformation and design of fasteners, screws, joints, springs, and bearings; lubrication and journal bearings. *Prereq.* 02.527.

02.529 Mechanical Design IV (2 cl., 2 q.h.)

Stresses and power transmission of spur, bevel, and worm gear; shaft design; clutches and brakes. *Prereq.* 02.528.

02.531 Measurements and Analysis Laboratory (2½ lab., 2 q.h.)

Principles of instrumentation, experimentation, data reduction and analysis by numerical and graphical techniques as related to experimental procedures of depicting accuracy, precision, true values, measured values, experimental error, and uncertainty. Procedures commensurate with student's academic background. *Prereq.* 11.319, 09.353, 10.323, 02.503.

02.532 Mechanical Engineering Technology Laboratory I (2½ lab., 2 q.h.)

Experimental procedures related to properties and characteristics of solids and incompressible fluids and measurements of mass flow rates by the application of various mechanical and fluid measuring instrumentation. *Prereq.* 02.531, 01.343.

02.533 Mechanical Engineering Technology Laboratory II (2½ lab., 2 q.h.)

Experimental procedures related to properties and characteristics of solids and incompressible fluids as they are influenced by isotropy, homogeneity, environmental conditions, and loads. Flow problems related to turbines, pumps, and pipe networks are also considered. *Prereq.* 02.532, 02.509 or concurrently.

02.534 Thermodynamics — Fluids Laboratory (2½ lab., 2 q.h.)

Experimental procedures related to compressible flow, energy conversion of fuels to steam as the working substance. Heat transfer and operating characteristics of thermal generators, engines, and compressors. *Prereq.* 02.533, 02.353, 02.557 or concurrently.

02.535 Thermodynamics Technology Laboratory I (2½ lab., 2 q.h.)

Experimental procedures related to operating characteristics of internal combustion engines, heating, refrigeration, air conditioning, and heat pump cycles. *Prereq.* 02.531, 02.558 or concurrently.

02.536 Thermodynamics Technology Laboratory II (2½ lab., 2 q.h.)

Experimental procedures related to the effects of fuel consumption, fuel efficiency, timing, manifold pressure, and environmental conditions on internal combustion engines. Psychrometrics, heat transfer, heating and cooling load, and environmental factors related to heating, refrigeration, air conditioning, and heat pump systems. *Prereq.* 02.535, 02.559 or concurrently.

02.541 Mechanical Behavior of Materials (2 cl., 2 q.h.)

Lectures on crystallography, mechanical properties and testing of materials and failure analysis, including tensile, fatigue, hardness and creep testing. Corrosion fundamentals and methods of prevention. *Prereq.* none.

02.542 Physical Behavior of Materials (2 cl., 2 q.h.)

Lectures on the physical properties of materials, concepts of solidification and alloying of materials, equilibrium diagrams and their relationship to microstructure, hardening and heat treatment of cast irons and steels. *Prereq.* 02.541.

02.543 Materials and Processes (2 cl., 2 q.h.)

Lectures on the uses of ferrous and non-ferrous metals, and non-metallic materials such as plastics, rubber, wood, and concrete. Processes include casting, mechanical working, powder metallurgy, welding, and machining. Included will be a discussion of non-traditional materials and processes. *Prereq.* 02.542.

02.554 Heat Transfer I (2 cl., 2 q.h.)

The primary modes of heat transfer; thermal conductivity; thermal conductance/resistance concept; thermal-electrical analogy; combined heat transfer mechanisms; basic equations of conduction; analytical solutions of various steady state conduction problems. *Prereq.* 02.353.

02.555 Heat Transfer II (2 cl., 2 q.h.)

Dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; black body radiation; Kirchhoff's law; emissivity and absorptivity; radiation between simple bodies; numerical methods. *Prereq.* 02.554.

02.556 Heat Exchanger Design (2 cl., 2 q.h.)

Log mean temperature differences; overall heat transfer coefficients; heat exchanger effectiveness; tubular exchanger design; regenerative and evaporative heat exchangers; heat transfer engineering problems. *Prereq.* 02.555.

02.557 Heat Engines and Turbines (2 cl., 2 q.h.)

Design and performance of heat engines: spark- and compression-ignition engines; steam and gas turbines. *Prereq.* 02.353.

02.558 Refrigeration (2 cl., 2 q.h.)

Principles of gas compression; analysis of vapor compression; refrigeration systems; low temperature refrigeration cycles; absorption refrigeration systems. *Prereq.* 02.353.

02.559 Air Conditioning (2 cl., 2 q.h.)

Air conditioning principles; psychrometrics; heat pumps; calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices. *Prereq.* 02.353.

02.560 Power Generation I (2 cl., 2 q.h.)

Basic power generation cycles; gas turbine cycles; effects of combustor temperature, intercooling, etc. on cycle performance; Rankine regenerative cycles; effects of steam temperature, pressure, number of feedwater heaters, etc. upon performance; steam generation equipment: boilers, reactors. *Prereq.* 02.353.

02.561 Power Generation II (2 cl., 2 q.h.)

Fossil fuel characteristics and effects on boiler design; combustion analysis; draft calculations; axial and centrifugal fan performance characteristics; pump design and performance consideration; heat exchanger design considerations. *Prereq.* 02.560.

02.562 Power Engineering (2 cl., 2 q.h.)

Applications of principles of economics to cycle and performance considerations; use of load curves; economic considerations of heat rate; economics of equipment selection; study of auxiliary equipment such as precipitators and flue gas desulfurization systems. *Prereq. 02.561, Economics.*

02.598 Special Problems In Mechanical Engineering Technology (2 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq. Consent of department chairman.*

02.599 Special Problems In Mechanical Engineering Technology (4 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq. Consent of department chairman.*

ELECTRICAL ENGINEERING TECHNOLOGY

03.301 Circuit Theory I (2 cl., 2 q.h.)

Ohm's law; Kirchhoff's current and voltage laws; equivalent resistances and sources; mesh and nodal analysis; network theorems; and power relations, all with respect to direct currents. *Prereq. 10.320 and 11.319.*

03.302 Circuit Theory II (2 cl., 2 q.h.)

Energy storage; singularity functions; response of R, L, and C elements to singularities. *Prereq. 03.301, 10.322 concurrently.*

03.303 Circuit Theory III (2 cl., 2 q.h.)

Complex algebra; phasors; frequency domain; mutual inductance; transformers; steady-state a-c theory; driving point and transfer impedances; power and energy in a-c circuits. *Prereq. 03.302.*

03.304 Circuit Theory IV (2 cl., 2 q.h.)

Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. *Prereq. 03.303.*

03.305 Circuit Theory V (2 cl., 2 q.h.)

Consideration of balanced and unbalanced polyphase power circuits; symmetrical components; harmonic analysis. *Prereq. 03.304.*

03.306 Electrical Measurements (2 cl., 2 q.h.)

Theory of the various techniques utilized in the measurement of voltage, current, power, impedance, frequency, etc. Error analysis of the specific techniques and the evaluation of the measured data obtained from them. Study of electronic measurement devices such as oscilloscopes, DVMs, counters and the operational amplifier as applied to measurement circuits. *Prereq. 03.304, 10.323*

03.311 Electronics I (4 cl., 4 q.h.)

Semiconductor diodes and applications; transistor and field effect transistor biasing techniques, graphical analysis of basic amplifiers, d.c. and a.c. load lines, temperature effects. *Prereq. 03.303, 11.323 or 11.320.*

03.312 Electronics II (4 cl., 4 q.h.)

Small signal low frequency transistor and FET models; amplifier circuits at low frequency; bypassing and coupling effects; multistage cascading and cascoding; transistors and FETs used as switches and current sources. *Prereq. 03.311.*

03.313 Electronics III (4 cl., 4 q.h.)

Differential amplifiers, using transistors and FETs; feedback and operational amplifiers; high frequency response; line drivers and impedance matching amplifiers, applications. *Prereq. 03.312.*

03.314 Pulse and Digital Circuits I (2 cl., 2 q.h.)

Wave shaping with RC, RL, clipping and clamping circuits; transient switching characteristics of diodes and transistors; analysis and design techniques of semiconductor switching circuits. *Prereq. 03.313.*

03.315 Pulse and Digital Circuits II (2 cl., 2 q.h.)

Principles of bistable, monostable, and astable operations; time base generation; sampling gates; sample and hold circuits; introduction to digital operations: review of the basic logic statements and theorems. *Prereq. 03.314.*

03.316 Pulse and Digital Circuits III (2 cl., 2 q.h.)

Logic gates; characteristics of DTL, TTL, ECL, CMOS and I²L logic families; flip-flops; counters and shift registers; analog to digital and voltage to frequency conversion techniques. *Prereq. 03.315.*

03.317 Principles of Communication Systems I (4 cl., 4 q.h.)

Signal analysis using Fourier methods; noise in communication systems; frequency selective amplifiers including wideband; transistor power amplifiers AF and RF; oscillators; signal sources and applications. *Prereq. 03.313.*

03.318 Principles of Communication Systems II (4 cl., 4 q.h.)

Basic theory of amplitude, frequency, phase and pulse code modulated systems; analysis of modulating and demodulating circuits; carrier systems using SSB; system block and level diagrams; logic control circuits in communication systems; modems. *Prereq. 03.317.*

03.319 Principles of Communication Systems III (4 cl., 4 q.h.)

Fundamentals of digital communications; sampling requirements; analog to digital conversion methods; system capacity and bandwidth; comparison of practical digital systems PAM, PCM, PFM, PWM; time and frequency division multiplexing; data decoding; selected examples from telemetry and computer links. *Prereq. 03.318.*

03.320 Electricity and Electronics I (2 cl., 2 q.h.) (not for electrical majors)

Introduction to circuit analysis, resistive networks, periodic excitation function, steady-state a-c circuits. *Prereq. 11.319.*

03.321 Electricity and Electronics II (2 cl., 2 q.h.)

The physical foundation of electronics; physical operation of electronic devices; single-stage electronic circuits. *Prereq. 03.320.*

03.322 Electricity and Electronics III (2 cl., 2 q.h.)

Magnetic circuits and transformers; electron-mechanical energy conversion; d-c machines; a-c machines. *Prereq.* 03.321.

03.323 Electronic Laboratory (3 lab., 2 q.h.)

Experiments dealing with meters and oscilloscopes illustrating proper laboratory measurement techniques. Investigation of the characteristics and applications of bipolar and field-effect transistors, unijunction transistors, semiconductor diodes, and silicon controlled rectifiers. Regulated power supplies, multistage transistor amplifier and simple feedback techniques are studied. *Prereq.* 03.312

03.324 Circuits Laboratory (3 lab., 2 q.h.)

Experimentation in electronic circuit theory utilizing various measurement techniques; instrumentation verification of circuit theorems; and extensive application of the oscilloscope for measurement. *Prereq.* 03.306.

03.325 Circuits Laboratory II (3 lab., 2 q.h.)

Further experimentation in electrical circuits and measurement techniques. Experiments include response of circuits to steps and impulses, non-linear devices, terminal characteristics of active devices, log modulus plots, network two-port parameters and Fourier analysis and synthesis. *Prereq.* 03.324.

03.327 Advanced Electronic Laboratory I (2½ lab, 2 q.h.)

Experiments dealing with the use of oscilloscopes, the examination of transistor audio amplifiers, push-pull amplifiers, drivers, pulse and video amplifiers, transients and wave-shaping circuits, audio frequency oscillators, and the study of operational amplifiers. One section will offer additional experiments in digital logic circuits in place of some communication oriented circuits. *Prereq.* 03.323, 03.313.

03.328 Advanced Electronic Laboratory II (2½ lab., 2 q.h.)

Experiments dealing with the modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, astable multivibrators, logic gates, flip-flops, binary adders, registers and counters; active filters, frequency modulation detectors, and analog-to-digital and digital-to-analog conversion. One section will offer study of the use of an interactive display terminal. *Prereq.* 03.327.

03.329 Advanced Electronic Laboratory III (2½ lab., 2 q.h.)

Spectral studies of FM and PM waves, amplitude limiters; the balanced modulators and single sideband generators; integrated circuit timers and monolithic random access memory; monolithic phase-locked loop as well as a series of microwave experiments. One section will offer additional experiments in logic circuits and the programming and use of the PDP-8 minicomputer in BASIC language in place of the communication oriented circuits. *Prereq.:* 03.328.

03.330 Microwave Measurements (2 cl., 2 q.h.)

A discussion of basic microwave measurements techniques including continuous wave versus swept systems; analysis of detectors, insertion loss, attenuators, filters, return loss, couplers, insulators, amplifiers, audative devices. *Prereq.* 03.329.

03.331 Energy Conversion I (2 cl., 2 q.h.)

Generalized theory of electromechanical energy conversion; magnetic circuit calculations, electromechanical devices, two winding transformer operation and its practical equivalent circuit. *Prereq. 03.303 and 10.323.*

03.332 Energy Conversion II (2 cl., 2 q.h.)

General torque equation applied to singly- and doubly-excited rotating devices. Induction and synchronous machine; equivalent circuits, applications, and steady state analysis. *Prereq. 03.331.*

03.333 Energy Conversion III (2 cl., 2 q.h.)

Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. D.C. machine; transfer functions and flow chart analysis. *Prereq. 03.332.*

03.334 Control Circuits I (2 cl., 2 q.h.)

Basic control design considerations and review of circuit theory; Laplace transforms and circuit transfer functions; time and frequency response relationships, Bode diagrams and stability; block diagram manipulation and general feedback applications. *Prereq. 03.304.*

03.335 Control Circuits II (2 cl., 2 q.h.)

Functional characteristics of common control circuit devices; potentiometers, synchros, control motors, gear trains, transistor and FET amplifiers, modulators and demodulators, operational amplifiers; open and closed loop system steady-state analysis and lead-lag compensating network design for specified gain and phase margin. *Prereq. 03.334.*

03.336 Control Circuits III (2 cl., 2 q.h.)

Study of second order systems in terms of time and frequency domain specifications; design of a control system to meet stability, bandwidth and accuracy specifications using Bode and Nichols plots; functional characteristics and operation of SCR's and magnetic amplifiers; industrial applications to polyphase control circuits including speed and voltage regulation and temperature control. *Prereq. 03.335.*

03.337 Basic Power Systems I (4 cl., 4 q.h.)

Consideration of power transmission lines; line constants; current, voltage, and power relations; introduction to electric-power distribution loads, feeders, and substations; application of matrices. *Prereq. 03.304.*

03.338 Basic Power Systems II (4 cl., 4 q.h.)

Consideration of symmetrical and unsymmetrical faults; protective devices—application and coordination; power flow in electric circuits; steady-state power limitations of systems; voltage regulation theory and application. *Prereq. 03.337.*

03.339 Basic Power Systems III (4 cl., 4 q.h.)

Computer applications to power systems with emphasis on load-flow studies; basic ideas of systems planning, short-circuit studies and system stability. *Prereq. 03.338.*

03.341 Power and Controls Laboratory I (2½ lab., 2 q.h.)

These experiments introduce the student to standard laboratory measurement equipment including voltmeter, ammeters, oscilloscopes and frequency counters as

well as data-taking methods and report writing. Devices investigated include diodes, bipolar transistors, field effect devices, silicon control rectifiers, unijunction transistor, power supplies, regulators and various types of feedback transistor amplifiers. *Prereq. 03.333 and 03.334 or concurrently.*

03.342 Power and Controls Laboratory II (2½ lab., 2 q.h.)

Experiments with characteristics of DC motors and generators, single and multiple phase transformers, induction motors, synchronous motors and 3 phase power measurements. *Prereq. 03.341.*

03.343 Power and Controls Laboratory III (2½ lab., 2 q.h.)

Experiments with self-synchronous devices such as control transformers, transmitters and receivers, AC and DC servomotors, open and closed loop response of servo mechanisms and stepping motors. *Prereq. 03.342.*

03.346 Electronics for Industry I (2 cl., 2 q.h.)

Two-terminal devices; diode rectifiers and filters; transistors and vacuum tubes; D. C. biasing. *Prereq. 03.302.*

03.347 Electronics for Industry II (2 cl., 2 q.h.)

Small signal analysis; field effect transistors; multi-stage systems; decibel and frequency considerations; large signal amplifiers. *Prereq. 03.346.*

03.348 Electronics for Industry III (2 cl., 2 q.h.)

PNPN and other devices; differential and operational amplifiers; regulators and miscellaneous circuit applications; cathode ray oscilloscope. *Prereq. 03.347.*

03.349 Advanced Electronic Laboratory IV (2½ lab., 2 q.h.)

Electronic Engineering exercises selected from the following topics: transistor amplifier design, operational amplifiers, analog computation, Fourier optics, acoustics, and microwaves. *Prereq. 03.329 or equivalent.*

03.350 Advanced Electronic Laboratory V (2½ lab., 2 q.h.)

Design projects laboratory. Students will be directed in design of such projects as motor speed control, DC-DC converter, high current pulse amplifiers, etc. *Prereq. 03.349.*

03.360 Introduction to Radar Systems (4 cl., 4 q.h.)

Discussion of radar range equation; examination of CW, FM, MTI, Pulse-Doppler and monopulse systems; description of transmitter, antennas, and receivers; and a discussion of information extraction from typical radar waveforms. *Prereq. 03.316 and 03.319.*

03.361 Transients in Linear Systems I (2 cl. 2 q.h.)

Application of differential equations to the solutions of linear, time-invariant electrical networks; introduction to singularity functions, convolution, and time domain transient analysis. *Prereq. 10.324 or concurrently, 03.304 or equivalent.*

03.362 Transients in Linear Systems II (2 cl., 2 q.h.)

Network topology and duality; introduction to the methods of transformation calculus and complex frequency concepts; signal analysis in the frequency domain; Fourier series; Fourier and Laplace transform methods. *Prereq. 10.325 or concurrently, 03.361.*

03.363 Transients in Linear Systems III (2 cl., 2 q.h.)

A varied selection of circuit problems are solved using Laplace transforms and related theorems. *Prereq.* 03.362.

03.364 Advanced Circuit Theory I (2 cl., 2 q.h.)

Definitions and tests are lumped, linear, time-invariant systems; review of matrix algebra; general analysis of networks by loop current and node voltage variables using matrix techniques. *Prereq.* 03.363.

03.365 Advanced Circuit Theory II (2 cl., 2 q.h.)

A study of two-port networks using various parameter systems; S-plane analysis of system response; general filter analysis. *Prereq.* 03.364.

03.366 Advanced Circuit Theory III (2 cl., 2 q.h.)

Discussion of the necessary and sufficient conditions for the physical realization of impedance functions; Forster and Cauer forms; synthesis of filters. *Prereq.* 03.365.

03.367 Advanced Pulse and Digital Circuits I (2 cl., 2 q.h.)

Linear and non-linear pulse forming and processing techniques; design of gate and binary circuits for operation under severe environmental conditions. *Prereq.* 03.363.

03.368 Advanced Pulse and Digital Circuits II (2 cl., 2 q.h.)

Analysis of applications of existing integrated circuits. *Prereq.* 03.367.

03.369 Advanced Pulse and Digital Circuits III (2 cl., 2 q.h.)

Negative-impedance devices and their applications; linear voltage and current sweep circuits. *Prereq.* 03.368.

03.371 Analog and Digital Computer Technology I (Analog-Digital Computers)
(2 cl., 2 q.h.)

Theory and operation of analog computers; frequency and amplitude scaling of the analog computer, application of the analog computer to the solution of linear differential equations. Introduction to number systems and computer codes. A study of various number base systems with particular emphasis on sign-magnitude representation of binary, ones complement, and twos complement systems. *Prereq.* 10.325 and 03.303.

03.372 Analog and Digital Computer Technology II (Algebra of Switching Functions—Introduction to Computer Architecture) (2 cl., 2 q.h.)

Introduction to digital computer design. Topics include boolean algebra, karnough mapping techniques and synthesis of switching networks; introduction to general computer architecture and organization. A minicomputer architecture will be examined. *Prereq.* 03.371.

03.373 Analog and Digital Computer Technology III (Introduction to Microprocessors) (2 cl., 2 q.h.)

Introduction to microprocessors, architecture, and organization. Study of the machine language and assembly coding of an industry-accepted microprocessor. A suitable topic selected from the current literature by the instructor will be analyzed in a report by each student. Assembling language coding problems will be assigned. *Prereq.* 03.372.

03.374 Digital Systems I (2 cl., 2 q.h.)

Basic concepts of Boolean Algebra; switching components; review of number systems, codes, and negative number representation; analysis and synthesis of combinational circuits; examples of application. *Prereq.* 03.316.

03.375 Digital Systems II (2 cl., 2 q.h.)

Data acquisition techniques; analysis and synthesis of sequential circuits; examples of applications; analog and digital data reduction; real time data processing. *Prereq.* 03.374.

03.376 Digital Systems III (2 cl., 2 q.h.)

Residue number systems; threshold logic concepts; advanced digital system techniques with application to complex systems; data decommutation techniques relative to communications systems; aerospace telemetry systems. *Prereq.* 03.375.

03.377 Control Systems I (2 cl., 2 q.h.)

Analysis of linear servomechanisms under both transient and steady-state conditions; signal flow graphs. *Prereq.* 03.363.

03.378 Control Systems II (2 cl., 2 q.h.)

Laplace transforms used in the formulation of block diagrams and transfer functions; system stability; root locus techniques. *Prereq.* 03.377.

03.379 Control Systems III (2 cl., 2 q.h.)

Treatment of Nyquist criteria, and Bode diagram methods for systems evaluation; feedback control system performance based on the frequency response; methods of compensation. *Prereq.* 03.378.

03.381 Linear Active Circuit Design I (2 cl., 2 q.h.)

Effects of feedback on impedance levels, frequency response and distortion. Use of block diagram algebra and computation of transfer functions, frequency response. Stability of feedback circuits, Nyquist, Bode and Nichols plots. Applications of Op-Amp circuits in integrators, differentiators and active filters. *Prereq.* 03.13.

03.382 Linear Active Circuit Design II (2 cl., 2 q.h.)

Building blocks for multistage amplifiers. Analysis of differential amplifier stages, drifts, offset, CM rejection ratio. High frequency behavior of transistors. Frequency response of multi-stage transistor amplifiers. Compensation techniques in feedback amplifiers. *Prereq.* 03.381.

03.383 Linear Active Circuit Design III (2 cl., 2 q.h.)

Applications of Op-Amps. Function generators, comparators, sample and hold D/A, A/D converters, oscillators, phase locked loops. Power amplifiers class A,B, AB, and C. Thermal analysis of power circuits. Switching amplifiers. *Prereq.* 03.382.

03.384 Microwave Semiconductor Devices and Circuits I (2 cl., 2 q.h.)

Provides basic understanding of the principles and design techniques for microwave circuits utilizing semiconductor devices; introduction to microwave theory and techniques; development of the Smith Chart for the graphical solution of microwave problems. *Prereq.* 03.304.

03.385 Microwave Semiconductor Devices and Circuits II (2 cl., 2 q.h.)

Introduction to the basic properties of semiconductors at microwave frequencies including analysis of bulk semiconductor effects and of junction phenomena. The course will analyze the physical properties and microwave characteristics of avalanche diodes, varactor diodes, tunnel diodes, PIN diodes, Gunn effect devices, and the microwave transistors. *Prereq.* 03.384.

03.386 Microwave Semiconductor Devices and Circuits III (2 cl., 2 q.h.)

Design and utilization of semiconductor devices in microwave circuits for microwave generation, amplification, frequency conversion, multiplication, and detection; introduction to the miniaturization of microwave circuits and the integration of microwave functions; the characteristics and limitations of the devices. *Prereq.* 03.385.

03.387 Integrated Circuits I (2 cl., 2 q.h.)

Linear integrated circuits; operational amplifier characteristics; selection criteria; linear and nonlinear circuit applications. *Prereq.* 03.313.

03.388 Integrated Circuits II (2 cl., 2 q.h.)

Digital building blocks; truth tables and synthesis of digital logic; flip-flops and timing circuits; logic families and specifications; arithmetic operations. *Prereq.* 03.387.

03.389 Integrated Circuits III (2 cl., 2 q.h.)

Counters; registers and decoding; digital voltmeter; D/A converter; digital frequency multiplier. *Prereq.* 03.388.

03.391 Computer Technology Laboratory II (2½ lab., 2 q.h.)

Logic performing circuits; flip-flops; binary-counters; shift registers, adders, code conversion, astable multivibrators, analog-to-digital and digital-to-analog conversion as well as the use of an interactive display terminal. *Prereq.* 03.327.

03.392 Computer Technology Laboratory III (2½ lab., 2 q.h.)

A continuation of 03.391 topics plus the study of integrated circuit timers, monolithic random access memory, and the use of the PDP-8 minicomputer in BASIC language. *Prereq.* 03.391.

03.396 Basic Optics for Instrumentation (2 cl., 2 q.h.)

Provides the necessary background for the two instrumentation courses listed below. Includes basic topics in geometrical and physical optics. No previous background in optics is assumed. Topics included are: Gaussian optics, fundamental laws of image formation, basic elements of optical design, scalar wave theory, interference and diffraction, polarization, basics of coherent (laser) and non-coherent optics. *Prereq.* 10.308.

03.397 Optical Instrumentation I (2 cl., 2 q.h.)

Treats the classical image-forming instruments (telescopes, microscopes, etc.) as components of optical systems. Includes magnification, aberrations, resolution criteria, photometry, compatibility of system components and optimization of systems. Topics in coherent imaging such as phase contrast and holography. *Prereq.* 03.396.

03.398 Optical Instrumentation II (2 cl., 2 q.h.)

The basic non-image forming systems used for analysis control and metrology. Includes spectroscopy, interferometry (classical and holographic), electron-ion optical, and X-ray systems. *Prereq.* 03.397.

03.399 Fundamentals of Operational Amplifiers (2 cl., 2 q.h.)

Emphasis on treating the amplifier as a black box. Covers gain, distortion, feedback, matching, offset, drift, and frequency response. A section on practical applications. *Prereq.* 03.312.

03.410 Electrical Measurements (4 cl., 4 q.h.)

(Day Curriculum)

Measurement of voltage, current, power, resistance, capacitance, inductance, impedance, frequency, etc.; direct and substitution measurements; evaluation of measured data—standard deviation and tolerance limits, instruments calibrations—effects of residual impedance, measurement of sheet magnetic materials; use of the Wheatstone bridge for industrial control techniques; laboratory demonstrations of equipment. *Prereq.* 03.454, 10.421.

03.411 Electronics I (4 cl., 4 q.h.)

(Day Curriculum)

Semiconductor diodes; power supplies and filters. Transistors as amplifying devices. Graphical analysis of basic amplifiers; d-c and a-c load lines. Transistor biasing techniques. *Prereq.* 03.456, 03.440.

03.412 Electronics II (4 cl., 4 q.h.)

(Day Curriculum)

Small-signal, low-frequency transistor models. A-c equivalent circuits; low frequency amplifier circuits. Frequency effects in audio amplifiers. High-frequency transistor model. Voltage regulation. *Prereq.* 03.411.

03.413 Electronics III (4 cl., 4 q.h.)

(Day Curriculum)

Continuation of transistor circuits. Untuned amplifiers, feedback amplifiers and oscillators, low-frequency large signal amplifiers. Field effect transistor circuits. *Prereq.* 03.412.

03.420 Electricity and Electronics I (4 cl., 4 q.h.)

(Day Curriculum)

Introduction to circuit analysis, resistive networks, periodic excitation function, steady state a-c circuits; the physical foundations of electronics and the physical operation of electronic devices. *Prereq.* 11.319.

03.421 Electricity and Electronics II (4 cl., 4 q.h.)

(Day Curriculum)

Single-stage electronic circuits, magnetic circuits and transformers, electro mechanical energy conversion, d-c machines, a-c machines. *Prereq.* 03.420.

03.423 Electronic Laboratory (3 lab., 2 q.h.)

(Day Curriculum)

Experiments dealing with laboratory equipment (meters and oscilloscopes) techniques; junction and field-effect transistor characteristics; vacuum and semiconductor diodes; power supplies including the regulated type; silicon controlled rectifiers; resistance-coupled amplifiers using transistors, including feedback methods. *Prereq.* 03.412.

03.424 Circuits Laboratory I (3 lab., 2 q.h.) (Day Curriculum)

Experimentation in electronic circuit theory utilizing various measurement techniques. Instrumentation verification of circuit theorems; response of circuits to steps and impulses; oscilloscope theory and applications. *Prereq.* 03.451.

03.425 Circuits Laboratory II (3 lab., 2 q.h.) (Day Curriculum)

Further experimentation in electrical circuits and measurement techniques. Experiments include response of circuits to steps and impulses, non-linear devices, terminal characteristics of active devices, log modulus plots, network parameters and synthesis. Fourier analysis and synthesis. *Prereq.* 03.424.

03.427 Advanced Electronic Laboratory I (3 lab., 2 q.h.) (Day Curriculum)

Experiments dealing with the use of oscilloscopes, the examination of transistor audio amplifiers, push-pull amplifiers, drivers, pulse and video amplifiers, transients and wave-shaping circuits, audio frequency oscillators, and the study of operational amplifiers. *Prereq.* 03.425.

03.428 Advanced Electronic Laboratory II (3 lab., 2 q.h.) (Day Curriculum)

Experiments dealing with the modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, astable multivibrators, logic gates flip-flops, binary adders, registers and counters; active filters, frequency modulation detectors and analog-to-digital and digital-to-analog conversion. *Prereq.* 03.427.

03.429 Advanced Electronic Laboratory III (3 lab., 2 q.h.) (Day Curriculum)

Spectral studies of FM and PM waves, amplitude limiters; the balanced modulators and single sideband generators; integrated circuit timers and monolithic random access memory; monolithic phase-locked loop as well as a series of microwave experiments and a series of digital experiments. *Prereq.* 03.428.

03.430 Energy Conversion (4 cl., 4 q.h.) (Day Curriculum)

Generalized theory of rotating energy conversion devices; steady-state operation of the multiply-excited direct-current machine; control of speed; special machines; transformers; steady-state considerations of induction and synchronous machines; generalized machine and circuit model; Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. *Prereq.* 03.452 and 10.422.

03.437 Distributed Systems (4 cl., 4 q.h.) (Day Curriculum)

Radiation, transmission, and reception of electromagnetic waves; distributed-line constants and traveling waves of transmission lines; differential equations of the uniform line. *Prereq.* 10.422.

03.440 Physical Electronics (4 cl., 4 q.h.) (Day Curriculum)

Electron ballistics and applications. Properties of atoms and electrons as related to conduction of electricity in solids. Fundamentals of semiconductors, crystal diodes, and transistors. Theory of field-effect transistors, integrated circuits, and photoelectric devices. *Prereq.* 11.420.

03.451 Circuit Analysis I (4 cl., 4 q.h.) (Day Curriculum)

Ohm's law, Kirchoff's current and voltage laws, equivalent resistances and sources, mesh and modal analysis, network theorems, two-port networks and power relations—all with respect to direct currents; energy storage, singularity functions, response of R, L, and C elements to singularities. *Prereq.* 10.320, 11.319.

03.452 Circuit Analysis II (4 cl., 4 q.h.) (Day Curriculum)

Complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-state a-c theory, driving point and transfer impedances, power and energy in a-c circuits; Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. *Prereq.* 03.451.

03.453 Circuits Analysis III (4 cl., 4 q.h.) (Day Curriculum)

Application of differential equations to the solutions of linear, time-invariant electrical networks; introduction to singularity functions, convolution, and time domain transient analysis; network topology and duality; introduction to the methods of transformation calculus and complex frequency concepts. *Prereq.* 03.442.

03.454 Circuits Analysis IV (4 cl., 4 q.h.) (Day Curriculum)

Signal analysis in the frequency domain; Fourier series; Fourier and Laplace transform methods; a varied selection of circuit problems is solved using Laplace transforms and related theorems. *Prereq.* 03.453.

03.460 Engineering Analysis I (4 cl., 4 q.h.) (Day Curriculum)

Linear algebra and its application to circuit equations; solution of linear differential equations including an introduction to Laplace transforms. *Prereq.* 10.422 and 03.452.

03.462 Basic Power Systems I (4 cl., 4 q.h.) (Day Curriculum)

Consideration of power transmission lines; line constants; current voltage and power relations; introduction to electric-power distribution loads, feeders, and substations; application of matrices. *Prereq.* 03.454.

03.463 Basic Power Systems II (4 cl., 4 q.h.) (Day Curriculum)

Consideration of symmetrical and unsymmetrical faults; protective devices—application and coordination; power flow in electric circuits; steady-state power limitations of systems; voltage regulation theory and application. *Prereq.* 03.462.

03.464 Basic Power Systems III (4 cl., 4 q.h.) (Day Curriculum)

Computer applications to power systems with emphasis on load-flow studies; basic ideas of systems planning, short-circuit studies and system stability. *Prereq.* 03.463.

03.470 Digital Computers (4 cl., 4 q.h.) (Day Curriculum)

Introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, Boolean Algebra applications to computer design. *Prereq.* 03.413 or concurrently.

03.477 Control Engineering I (4 cl., 4 q.h.) (Day Curriculum)

Analysis of linear servomechanisms under both transient and steady-state conditions; signal flow graphs; Laplace transforms used in the formulation of block diagrams and transfer function. *Prereq.* 03.454 and 10.422.

03.478 Control Engineering II (4 cl., 4 q.h.) (Day Curriculum)

System stability; root locus techniques; treatment of Nyquist criteria and Bode diagram methods for systems evaluation. *Prereq.* 03.477.

03.490 Optical Instrumentation (4 cl., 4 q.h.) (Day Curriculum)

Telescopes, microscopes, etc., as optical system components. Includes magnification, aberrations, resolution criteria, photometry. Compatibility of system components and optimization of systems. The basic non-image forming systems used for analysis control and metrology. *Prereq. 10.308 and 11.319.*

03.499 Special Problems in Electrical Engineering Technology (4 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq. Consent of department chairman.*

03.500 Microprocessor Hardware I (2 cl., 2 q.h.) (Lab. Fee)

Students become involved in detailed aspects of microcomputer construction and have the opportunity to construct their own microcomputer in conjunction with classroom lectures. Lectures provide detailed instructions for the particular design used in the course. General theory of design applicable to other computer systems; construction and testing of the basic hardware. Power supply construction I/O panel construction, microprocessor components and architecture, static memory construction, alternate memory types, timing requirements, system clock construction, power supply test, timing circuit test. *Prereq. Knowledge of programming.*

03.501 Microprocessor Hardware II (2 cl., 2 q.h.) (Lab. Fee)

Installation of the processor and initial operational status of the computer: Processor instruction set, timing cycles and states, testing the processor, safeguarding the processor, fault location techniques, introduction to assembly language, programming techniques, diagnostic programs, elementary I/O port construction, alternate I/O types, testing of I/O devices. *Prereq. 03.500.*

03.502 Microprocessor Hardware III (2 cl., 2 q.h.) (Lab. Fee)

A continuation of 03.501. Advanced I/O devices and peripheral hardware. Interrupt hardware, installation and use of PROM, bootstrap loaders, current loop interfaces, EIA compatible devices, real time clocks, D/A converters, A/D converters, multiplexers, modems, keyboards, printers, CRT'S, TV-typewriter displays, advanced diagnostic techniques, discussion of other microprocessors. *Prereq. 03.501.*

03.598 Special Problems in Electrical Engineering Technology (2 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq. Consent of department chairman.*

03.599 Special Problems in Electrical Engineering Technology (4 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq. Consent of department chairman.*

CHEMICAL ENGINEERING TECHNOLOGY

04.381 Nuclear Technology I (2 cl., 2 q.h.)

Atomic and nuclear structure; discovery and nature of radioactivity; nuclear instrumentation for particle detection, monitoring, and experimentation; supplementary laboratory experiments. *Prereq. 10.323 and 11.319.*

04.382 Nuclear Technology II (2 cl., 2 q.h.)

Nuclear reactions and energy; induced nuclear transformations; neutron properties;

radiological safety—the hazards, problems, and protection; applications of radio-nuclides; supplementary laboratory experiments. *Prereq.* 04.381.

04.383 Nuclear Technology III (2 cl., 2 q.h.)

The fission process and its applications; nuclear reactors—their classification, design and application; nuclear fuel processing; radioactive waste disposal; supplementary laboratory experiments. *Prereq.* 04.382.

04.481 Nuclear Technology (4 cl., 4 q.h.)

(Day Curriculum)

Atomic and nuclear structure; discovery and nature of radioactivity; nuclear reactions and energy; induced nuclear transformation; neutron properties; nuclear instrumentation for particle detection, monitoring, and experimentation; the fission process and its applications; nuclear reactors—their classification, design, and application; supplementary laboratory experiments. *Prereq.* 10.422 and 11.319.

INDUSTRIAL ENGINEERING TECHNOLOGY

05.580 Engineering Economy I (2 cl., 2 q.h.)

Fundamental accounting concepts and familiarization with terminology. Assets, liabilities, net worth. Analysis of income statement and balance sheet. Flow of funds in a form. Sources of capital—equity, borrowed, retained earnings, depreciation and depreciation accounting, taxes. *Prereq.* none.

05.581 Engineering Economy II (2 cl., 2 q.h.)

Cost of capital, time value of money, equivalence, cash flow of diagrams and tables. Development of cash flows for alternative capital expenditures, analytical methods of engineering economy including present worth, annual cost and rate of return. Incremental rate of return, breakeven analysis. Retirement and replacement. *Prereq.* 05.580.

05.582 Industrial Technology I (2 cl., 2 q.h.)

Concepts of methods analysis and work simplification, use of man-machine charts, principles of motion economy, human considerations in designing man-machine systems. *Prereq.* none.

05.583 Industrial Technology II (2 cl., 2 q.h.)

Work measurement, techniques of measurement to include stop watch, micro-motion, memomotion, work sampling and predetermined systems. Development of standard data. Establishment of standards, fatigue and delay allowances, rating techniques, incentive plans. *Prereq.* 05.582.

05.590 Engineering Probability and Statistics I (2 cl., 2 q.h.)

Algebra of events and sets. Probability measure, Laws of Probability. Independence, conditional probability. Random variables, discrete and continuous. Properties of random variables including density functions, expectations, variance. *Prereq.* 10.323.

05.591 Engineering Probability and Statistics II (2 cl., 2 q.h.)

Sampling statistics. Estimation of parameters of random variables. Point and interval estimation. Hypothesis testing. Simple and composite hypothesis. One-sided and two-sided tests. Tests of measures of variances. Normal, standard deviation, F , X^2 . *Prereq.* 05.590.

ENGINEERING GRAPHICS AND COMPUTATION

09.307 Electronic Graphics I (2 cl., 2 q.h.)

Instrument techniques; principles of projection, drawing, reading, and interpretation of multiview drawings; isometric, oblique, pictorial representations; auxiliary views and sections. *Prereq. none.*

09.308 Electronic Graphics II (2 cl., 2 q.h.)

Introduction to electronic graphics, including symbols, schematics, block and logic diagrams, production and cable drawings, military standards. *Prereq. 09.307.*

09.309 Electronic Graphics III (2 cl., 2 q.h.)

A study of single- and double-sided printed circuit layout, integrated circuits, electro-mechanical designs, wiring, and interconnection diagrams; graphical data presentation. *Prereq. 09.308.*

09.311 Engineering Graphics I (2 cl., 2 q.h.)

Introduction to engineering drawing, geometric construction, charts and graphs, orthographic projection through auxiliary views. *Prereq. none.*

09.312 Engineering Graphics II (2 cl., 2 q.h.)

Detail drawing, including intersections and development; reading of multiview drawings; pictorial representation. *Prereq. 09.311.*

09.313 Engineering Graphics III (2 cl., 2 q.h.)

Manufacturing processes and dimensioning; topographical; earth work; drawing analysis of assemblies; case studies in engineering design. *Prereq. 09.312.*

09.314 Engineering Design I (Kinematics) (1 cl., 2 lab., 2 q.h.)

Translatory and rotary motion involving basic mechanisms through graphical vector and mathematical analysis of displacement and velocity; some redesign of existing mechanisms; simple, compound, reverted, and epicyclic gear trains. *Prereq. 09.313, 11.317.*

09.315 Engineering Design II (1 cl., 2 lab., 2 q.h.)

Drawings and specifications for the production and precision machining of castings, forging, weldments, etc.; discussion of design components. *Prereq. 09.314.*

09.316 Engineering Design III (1 cl., 2 lab., 2 q.h.)

Introduction to design through graphical analysis of cam and follower motions and other mechanisms; creativity and design processes through case studies and original projects requiring oral presentation of student's involvement in both synthesis and innovative activities. *Prereq. 09.315.*

09.351 Principles of Computer Programming I (2 cl., 2 q.h.)*

Rules for forming simple FORTRAN programs. Students write and run programs to complete Fibonacci sequences, averages, kinematic displacements, and maxima and minima in both discrete and continuous cases; batch programming in FORTRAN IV; introduction to computer organization and machine language. *Prereq. 10.308.*

*NOTE: Students at suburban campuses will find it necessary periodically to come to the Boston Campus Computation Center to run their homework problems.

09.352 Principles of Computer Programming II (2 cl., 2 q.h.)*

Extended capabilities of the FORTRAN language, including DO loops, subscripted variables, and alphanumeric arrays. Students write and run application programs for printer plotting, sorting, matrix algebra, and approximations. Batch programming in FORTRAN IV. *Prereq. 09.351.*

09.353 Principles of Computer Programming III (2 cl., 2 q.h.)*

Subroutine and function subprograms; use of Scientific Subroutine Package with programming applications in probability, solution of simultaneous linear equations, root finding and quadrature; introduction to use of plotter; batch programming in FORTRAN IV. *Prereq. 09.352.*

09.354 Computer Systems I (2 cl., 2 q.h.)

Machine architecture and language: machine structure, machine language, addressing methods, assembly language, assemblers, macro language, and macro-processors. *Prereq. 09.353 or equiv. FORTRAN programming experience.*

09.355 Computer Systems II (2 cl., 2 q.h.)

Compilers and higher level languages: loader schemes, absolute and linking loaders, programming languages, formal systems and programming languages, introduction to compilers. *Prereq. 09.354.*

09.356 Computer Systems III (2 cl., 2 q.h.)

Data base management and operating systems: phases of a compiler, data structures; operating systems, I/O programming, resource management, information management, data bases and file systems. *Prereq. 09.355.*

09.357 Computer Aided Design I (Computer Graphics) (2 cl., 2 q.h.)

Computer graphics programming, using the computer to draw two- and three-dimensional shapes; character generation and manipulation methods; Implementation on Northeastern's calcomp plotter. *Prereq. 09.353.*

09.358. Computer Aided Design II (Problem Oriented Languages) (2 cl., 2 q.h.)

Discussion of popular languages; user oriented requirements; input algorithms; command structure; design of a POL system. *Prereq. 09.353.*

09.359 Computer Aided Design III (Simulation and Mathematical Models)

(2 cl., 2 q.h.)

Random numbers programs to predict the outcome of probabilistic systems; Computer models of deterministic systems. *Prereq. 09.353.*

09.361 Computer Controlled Systems I (2 cl., 2 q.h.)

Introduction to minicomputers; minicomputers organization and logical components; basic machine language programming. *Prereq. 09.353.*

09.362 Computer Controlled Systems II (2 cl., 2 q.h.)

Extended programming of minicomputers; the use of a minicomputer as an element in process control; analysis of open and closed loop systems. *Prereq. 09.361.*

09.363 Computer Controlled Systems III (2 cl., 2 q.h.)

Specification of computer elements for a control system; design and synthesis of a computer-controlled system to meet process requirements. *Prereq.* 09.362.

09.365 Modern Programming Techniques I (2 cl., 2 q.h.)

Concept of structured programming for use in developing complex computer programs. Top down design, hierarchy diagrams, HIPO charts, composite design, design languages, flowcharting techniques, language preprocessors, macro processors, structured coding, structured FORTRAN. *Prereq.* 09.353 or comparable FORTRAN experience.

09.366 Modern Programming Techniques II (2 cl., 2 q.h.)

Specific examples of the use of structured programming and techniques for implementing computed programs. Structured FORTRAN, coding for style and efficiency, the RATFOR language, debugging, program and system testing, test and program documentation, the chief programmer team. Students write and run programs on the University's computer. *Prereq.* 09.365.

09.401 Interpretation of Industrial Drawings (2 cl., 2 q.h.)

(See General Interest Courses, pages 163-164.)

09.421 Principles of Computer Programming I (2 cl., 2 q.h.) (Day Curriculum)

Rules for forming simple FORTRAN programs; basic input/output techniques; FORMAT control; algorithms for solving simple scientific problems; computing large sums; maxima and minima in both discrete and continuous cases. *Prereq.* 10.308 or concurrently.

09.422 Principles of Computer Programming II (2 cl., 2 q.h.) (Day Curriculum)

Extended capabilities of the FORTRAN language; manipulation of vectors and arrays; subroutine and function subprogramming; continued applications of computers, sorting, merging, root determination; A-Format. *Prereq.* 09.421.

09.423 Principles of Computer Programming III (2 cl., 2 q.h.) (Day Curriculum)

Use of scientific subroutines, simulation, random numbers; introduction to numerical methods (solution of simultaneous equations, quadrature, derivations); use of plotter language; display of information. *Prereq.* 09.422.

09.461 Engineering Design Graphics I (2 cl., 2 q.h.) (Day Curriculum)

Introduction to engineering drawing; orthographic projection and primary auxiliary views; reading and interpreting of multiview drawings; isometric and oblique pictorial representation. An introduction to the decision-making process for engineering design. *Prereq.* none.

09.462 Engineering Design Graphics II (2 cl., 2 q.h.) (Day Curriculum)

Emphasis on engineering drawings required to support engineering design, including standard conventions, dimensioning, and basic production processes; shop detail drawings are covered; exercise in design processes is given through selected projects and case studies. *Prereq.* 09.461.

09.463 Engineering Design Graphics III (2 cl., 2 q.h.) (Day Curriculum)

Greater involvement in design by examination of many commonly used components; case studies of large systems discussed in class; advanced design projects assigned. *Prereq.* 09.462.

09.464 Engineering Design Graphics IV (4 cl., 4 q.h.) (Day Curriculum)

Graphical analysis of kinematic elements; displacement, locus generators, velocity vectors, and sliding motion; simple, compound, and reverted gear trains; acceleration analysis of mechanisms such as cams and linkages; functions, scales and nomographs; introduction to self-correcting (feedback) systems. *Prereq.* 09.463.

09.370 Programming Languages I (2 cl., 2 q.h.)

An introduction to assembler language programming (BAL) for intermediate and large computers. Students write and run illustrative programs on the University's computer. Representation of data, addressing, instruction format, RR, RS, SS, and SI instructions. Looping, indexing, binary and decimal arithmetic, data manipulation, and simple input/output. *Prereq.* 09.353 or *equiv.*

09.371 Programming Languages II (2 cl., 2 q.h.)

Advanced assembler language and operating system (OS) environment. Students write and run illustrative programs on the University's computer. Edit and translate instructions, macro writing, program sectioning and linking, I/O through operating system, job control language (JCL), system utilities, and operating system environment. *Prereq.* 09.370.

09.372 Programming Languages III (2 cl., 2 q.h.)

An introduction to major higher-level languages other than FORTRAN and COBOL. Students write and run simple illustrative programs on the University's computer. Topics include: method of language classification, introduction to BASIC, string processing and matrix manipulation in BASIC, ALGOL, PL/I, APL, problem-oriented languages. List processing languages, LISP, SNOBOL. *Prereq.* 09.353.

09.376 Micro/Mini Software I (2 cl., 2 q.h.)

Students write and run programs for micro and mini computers. CPU's, ALU's, ROM's, RAM's, PROM's and EROM's, notation methods, instruction formats, BCD/binary conversion, addressing schemes, table lookup, instruction timing, delay loops, I/O driving and buffering, instruction registers. *Prereq.* 09.353 or *equiv.*

09.377 Micro/Mini Software II (2 cl., 2 q.h.)

Students write and run programs for micro and minicomputers. Multiple precision, decimal and floating point arithmetic, character generation, error checking, interrupt handling, real time clocks, terminal interfaces and utility routines. *Prereq.* 09.376.

09.378 Micro/Mini Software III (2 cl., 2 q.h.)

Students write and run programs for micro and minicomputers. Subroutine linkage, relocatable programs, loaders, assemblers, macros, cross assembler emulators, compilers, peripheral interfacing, D/A and A/D converters, cache storage, a survey of available processors and their instruction sets. *Prereq.* 09.377.

09.380 Computer Peripherals I (2 cl., 2 q.h.)

Students study the design features and applications of I/O terminal and the more common peripheral devices. Alphanumeric, vector and raster-scan CRT's, impact-type line printers, chain and train printers, carriage control features, electrostatic and thermal DOT MATRIX printer plotters, teletypes and intelligent terminals, character sets and control characters, keyboard types, flat-bed and drum plotters, card and paper tape readers and punches. *Prereq.* Knowledge of programming.

09.381 Computer Peripherals II (2 cl., 2 q.h.)

Students study the various types of mass storage devices. Magnetic tape drives and controllers, 7 and 9 track tapes, recording methods and record gaps, blocking, labels and file organization. Cassette tapes, DEC-Tapes, disk drives and controllers, fixed and removable packs, head per track and moving head drives, track/cylinder/sector organization, capacities and access times, sequential and direct access files and access methods, floppy disks, drum, bulk and associative memories. *Prereq. Knowledge of programming.*

09.382 Computer Peripherals III (2 cl., 2 q.h.)

Students study various types of miscellaneous peripherals. Computer output micro-film (COM), optical character readers & OCR fonts, digitizers, data tablets, A/D and D/A converters, optical scanners, encoders, sensors, modems, data sets, acoustic couplers, LIARTs, EIA-interfaces. *Prereq. Knowledge of programming.*

09.383 Computer Analysis I (2 cl., 2 q.h.)

An introduction to computer methods used in mathematics. Programming technique and computational efficiency. Students write and run programs implementing algorithms developed in class. Interpolation and approximation, numerical integration and differentiation, solution of equations. *Prereq. 09.353 and 10.323 or equiv.*

09.384 Computer Analysis II (2 cl., 2 q.h.)

A continuation of 09.383. Vectors and matrices, systems of equations, differential equations, and empirical equations. *Prereq. 09.383.*

09.386, 09.387, 09.388 Software Applications Seminar I, II, III (2 cl., 2 q.h. each)

Special interest software applications are treated informally. Project-oriented student participation. State of the art subject matter varies from year to year. Planned topics include simulation software, security and privacy, artificial intelligence, and instructional systems. *Prereq. This course may be taken only in the senior year or by instructor's permission.*

09.390 Information Systems I (4 cl., 4 q.h.)

An introduction to COBOL programming with emphasis on information systems. Students write and run programs on the University's computer. Divisions of COBOL, data file structures & organization, types of input, output, storage device usage, record structures and organization. *Prereq. 09.353 or equiv.*

09.391 Information Systems II (2 cl., 2 q.h.)

An introduction to data base organization, structure and management. Students will write and run programs exemplifying techniques developed in class. Topics include: access methods, attributes, indices, querying, searching and matching, file sets, inverted file sets. *Prereq. 09.390.*

09.392 Information Systems III (2 cl., 2 q.h.)

An introduction to information systems performances evaluation. Students write and run programs exemplifying techniques developed in class. Merging and sorting performance measures, retrieval system performance, commercially available information systems. *Prereq. 09.391.*

09.393 Computer Graphics I (2 cl., 2 q.h.)

Students are introduced to generalized techniques for the computer plotting of 2 and 3 dimensional shapes. Students write and run programs using the University's computer and digital plotter. 2D translation and rotation, mirror imaging, linear expansion and contraction, 3 to 2d transforms, 3d translation, rotation and dilation, clipping, windowing and blanking, contouring and concatenation. *Prereq. 09.353 or equiv.*

09.394 Computer Graphics II (2 cl., 2 q.h.)

A continuation of Computer Graphics I. Students write and run programs using the University's computer and digital plotter. Intersection and polygen mathematics, shading techniques, surface representation, 3d anamorphosis, map projections, scales, characters, graphs and charts, curve fitting. *Prereq. 09.393.*

09.395 Computer Graphics III (2 cl., 2 q.h.)

A continuation of Computer Graphics II. Students write and run programs for the University's computer and digital plotter. Interactive graphics, raster scan composition, graphic data structures, envelopes, interpolation and extrapolation, hidden lines, graphic input techniques, color graphics, computer microfilming, survey of computer devices and packages. *Prereq. 09.394.*

09.396 Operating Systems I (2 cl., 2 q.h.)

A presentation of basic principles of operating systems and memory management. Students write and run programs exemplifying techniques developed in class when appropriate. Resource management, OS/MVT, design considerations, machine structure, assembly language programming. I/O programming, interrupt structure and processing, memory management, multiprogramming, partitioning, paging, segmentation, swapping, overlays. *Prereq. 09.353 or equiv.*

09.397 Operating Systems II (2 cl., 2 q.h.)

A presentation of central processor and I/O management methods. Students write and run programs exemplifying techniques developed in class when appropriate. Processor management, job and process scheduling, multiprocessor systems, process synchronization, device management, hardware considerations, channels and control units, device allocation, I/O controllers, schedulers, device handlers, virtual devices, file systems, allocation strategy. *Prereq. 09.396.*

09.398 Operating Systems III (2 cl., 2 q.h.)

A study of existing operating systems and their implementation. Students write and run programs exemplifying techniques developed in class when appropriate. A sample operating system's design, system stratification, nuclear components, analysis of processor, memory and device management, performance evaluation, IBM 360/370 OS, compatible time sharing, MULTICS, virtual machines. *Prereq. 09.397.*

09.500 Data Communications I (2 cl., 2 q.h.)

An introduction to teleprocessing. Technical aspects are treated during the first quarter. Communication hardware, line configuration, survey of terminals, controllers, modems, communication theory, types of modulation, line protocol, and simple inquiry/response systems. *Prereq. 09.353 or equiv.*

09.501 Data Communications II (2 cl., 2 q.h.)

A continuation of Data Communications I. Programming considerations are stressed. Programming conventions and techniques, complex inquiry/response systems, message switching, error recovery, and software packages. (BTAM, TCAM, and CICS). *Prereq.* 09.500.

09.502 Data Communications III (2 cl., 2 q.h.)

A continuation of Data Communications II. Minimizing network costs. Configuration design, vendor selection, equipment evaluation, feasibility study, queueing, simulation, existing systems. *Prereq.* 09.501.

09.598 Special Problems in Computer Technology (2 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq.* *Consent of department chairman.*

09.599 Special Problems in Computer Technology (4 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prereq.* *Consent of department chairman.*

MATHEMATICS

10.301 Introduction to Mathematics I (4 cl., 4 q.h. This credit cannot be used in the Associate Engineering, Associate in Science, or the Bachelor of Engineering Technology Degree programs.)

A comprehensive review of high school algebra including first-degree equations, factoring, fractions, fractional equations, ratio and proportion, word problems, and concepts of plane geometry. *Prereq.* none.

10.302 Introduction to Mathematics II (4 cl., 4 q.h. This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology Degree programs.)

Algebraic operations with complex fractions, mixed expressions, square roots, radicals, quadratic equations; simultaneous equations, graphs and fractional zero and negative exponents; the geometry of the right triangle, areas of polygons, circles, and loci problems. *Prereq.* 10.301.

10.303 Introduction to Mathematics

(Day Curriculum)

An accelerated combination of 10.301 and 10.302.

10.307 College Algebra and Trigonometry I (4 cl., 4 q.h.)

Fundamental algebraic operations; complex numbers; radicals and exponents; functions; linear and quadratic equations; irrational equations; inequalities; variation; roots of polynomial equations. *Prereq.* *Math. Placement Test or 10.302.*

10.308 College Algebra and Trigonometry II (4 cl., 4 q.h.)

Logarithms; trigonometric functions of angles in degrees and radians; trigonometric identities and equations; right triangles; oblique triangles; complex numbers in trigonometric form; systems of equations; determinants; sequences and series; the binomial theorem. *Prereq.* 10.307.

10.316 Probability and Statistics I (2 cl., 2 q.h.)

Basic tools, e.g., sets, permutations, and combinations; probability and applications. *Prereq.* 10.308, or 10.329 or 10.335.

10.317 Probability and Statistics II (2 cl., 2 q.h.)

Descriptive statistics; frequency distributions and probability density functions; normal and other distributions. *Prereq.* 10.316.

10.318 Probability and Statistics III (2 cl., 2 q.h.)

Bivariate distributions; correlation; statistical inference and estimation; regression. *Prereq.* 10.317.

10.320 Calculus I (4 cl., 4 q.h.)

Plane Analytic Geometry; differentiation of algebraic functions; rate, motion, maximum and minimum problems; derivations of higher order; curve sketching; basics in functions, limits, and continuity. *Prereq.* 10.308.

10.321 Calculus II (2 cl., 2 q.h.)

Integration of algebraic functions; integration and differentiation of logarithmic, exponential, and trigonometric terms; calculations of areas, volumes, and length of arc by definite integrals. *Prereq.* 10.320.

10.322 Calculus III (2 cl., 2 q.h.)

Differentiation and integration of inverse trigonometric functions; integration by parts, substitution, and tables; the Trapezoidal and Simpson Rules; the application of the differential and integral calculus to the Polar Coordinate System; indeterminate forms. *Prereq.* 10.321.

10.323 Calculus IV (2 cl., 2 q.h.)

Vectors in the plane; vectors in three-dimensional space; functions of more than one variable; partial differentiation; multiple integration; infinite series; Taylor's and Maclaurin's Formula. *Prereq.* 10.322.

10.324 Differential Equations I (2 cl., 2 q.h.)

Ordinary differential equations—standard types of the first order; some applications; special differential equations of second order. *Prereq.* 10.323.

10.325 Differential Equations II (2 cl., 2 q.h.)

Linear differential equations with constant coefficients, homogeneous and non-homogeneous; variation of parameters, simultaneous differential equations; Laplace transform. *Prereq.* 10.324.

10.326 Differential Equations III (2 cl., 2 q.h.)

Continuation of Laplace transform; series and solution of differential equations by series; Fourier series; orthogonal functions. *Prereq.* 10.325.

10.527 Mathematics I (3 q.h.)

Sets, number systems, fundamental operations of algebra, exponents, radicals, linear equations. *Prereq.* Math Placement Test or 10.302 or 10.331.

10.528 Mathematics II (3 q.h.)

Fractional equations; inequalities; functions, relations, graphs; quadratic equations; systems of equations; ratio, proportion, variation; logarithms. *Prereq.* 10.527.

10.529 Mathematics III (3 q.h.)

Progressions; introduction to calculus; rates of change, slopes, area under a curve, maximum and minimum problems; elementary matrix algebra. *Prereq.* 10.528.

10.330 Basic Mathematics I (2 cl., 2 q.h. This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology Degree programs.)

A review of elementary algebra; algebraic expressions and operations, equations, word problems. *Prereq.* none.

10.331 Basic Mathematics II (2 cl., 2 q.h. This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology Degree programs.)

Further review; operations with polynomials, factoring, fractional expressions, word problems. *Prereq.* 10.330.

10.532 Mathematics for Business Management I (3 q.h.)

Topics in mathematics applicable to management. Logic, set theory, probability with applications. Survey of mathematical models, linear models. *Prereq.* 10.529 and 39.313, or equivalent.

10.533 Mathematics for Business Management II (3 q.h.)

Linear programming problems, solution by graphing. Matrix algebra, markov chains, directed graph models, mathematics of finance. *Prereq.* 10.532.

10.534 Mathematics for Business Management III (3 q.h.)

Statistical decision theory, utility theory, theory of games, regression-based models. *Prereq.* 10.533.

10.351 Advanced Mathematics I (Numerical Analysis) (2 cl., 2 q.h.)

Basic methods of numerical analysis—roots by iteration; approximating polynomials and interpolation; least squares fitting; numerical integration; approximate solution of ordinary differential equations—problems employing the electronic computer. *Prereq.* 09.353 and 10.326.

10.352 Advanced Mathematics II (2 cl., 2 q.h.)

Introduction to partial differential equations, boundary-value problems, Sturm-Liouville systems. *Prereq.* 10.351.

10.353 Advanced Mathematics III (2 cl., 2 q.h.)

Special topics in analysis. *Prereq.* 10.352.

10.361 Modern Algebra I (2 cl., 2 q.h.)

Sets; binary operations; mappings; rings, integers, fields; rationals; reals, bases for computer applications; Euclidean algorithm; primes. *Prereq.* 10.308, 10.329 or 10.335.

10.362 Modern Algebra II (2 cl., 2 q.h.)

Field of complex number; groups; subgroups; polynomial rings; homomorphisms; isomorphisms, ideals. *Prereq.* 10.361.

10.363 Modern Algebra III (2 cl., 2 q.h.)

Vector spaces; linear transformations; dependence, independence; dimension applications to engineering, science, and business. *Prereq.* 10.362.

10.364 Modern Applied Algebra (4 cl., 4 q.h.)

Introduction to the language of abstract algebra to the following topics: graphs, finite state machines, programming languages, Boolean Algebra, lattices, coding for communication channels, and radar; look at algebraic theory of linear systems. *Prereq.* 10.361, 10.362 and 10.363.

10.401 Foundations of Mathematics I (2 cl., 2 q.h.)

(See General Interest Courses, page 156.)

10.402 Foundations of Mathematics II (2 cl., 2 q.h.)

(See General Interest Courses, page 157.)

10.403 Foundation of Mathematics III (2 cl., 2 q.h.)

(See General Interest Courses, page 157.)

10.404 Pre-Calculus Mathematics (4 cl., 4 q.h.)

The course treats those topics in algebra, trigonometry, and analytical geometry which will be of greatest value to the beginning calculus student. *Prereq.* none.

10.405 Theory of Gambling (2 cl., 2 q.h.)

A general interest course in various types of gambling games. A short review of the topics of permutations, combinations, and probability as they apply to some of the problems of gambling. Emphasis on the casino games of craps, roulette, chuck-a-luck, slot-machines, keno, and blackjack with an analysis of the players' expectations in each of these games. Winning strategies and card-counting methods in casino blackjack. Some problems on card games such as poker and acey-deucey, two-person matrix games, and state lottery games. A presentation of formulas for the law of averages and gamblers' ruin. *Prereq.* none.

10.407 College Algebra and Trigonometry I (4 cl., 4 q.h.)

(Day Curriculum)

Fundamental algebraic operations; complex numbers; radicals and exponents; functions; linear and quadratic equations; irrational equations; inequalities; variation; roots of polynomial equations. *Prereq.* Math. Placement Test or 10.302.

10.408 College Algebra and Trigonometry II (4 cl., 4 q.h.)

(Day Curriculum)

Logarithms; trigonometric functions of angles in degrees and radians; trigonometric identities and equations; right triangles; oblique triangles; complex numbers in trigonometric form; systems of equations; determinants. *Prereq.* 10.407.

10.420 Calculus I (4 cl., 4 q.h.)

(Day Curriculum)

Plane analytic geometry; differentiation of algebraic functions; rate, motion, maximum and minimum problems; derivations of higher order; curve sketching; basics in functions, limits, and continuity. *Prereq.* 10.408 or 10.329.

10.421 Calculus—A (4 cl., 4 q.h.)

(Day Curriculum)

Applications of derivatives to curve-sketching; antidifferentiation; the definite integral, with applications; calculus of non-algebraic functions—logarithmic, exponential, and trigonometric; calculus of inverse trigonometric functions; techniques of integration; polar coordinates; the conic sections; vectors in a plane; indeterminate forms; L'Hospital's rule. *Prereq.* 10.320.

10.422 Calculus—B (3 cl., 4 q.h.)

(Day Curriculum)

Calculus of functions of several variables; partial differentiation; multiple integrals; infinite series; vector analysis; matrices; and linear algebra. *Prereq.* 10.421.

10.423 Differential Equations (4 cl., 4 q.h.)

(Day Curriculum)

Ordinary differential equations—standard types of the first order; linear differential equations, especially with constant coefficients; Laplace transforms; series solutions of differential equations; Fourier series; and orthogonal functions. *Prereq.* 10.422.

PHYSICS

*Courses marked * not available in every curriculum. See curricula in Programs of Instruction section for applicable sequence, pp. 61-97.*

11.301 Introductory Physics I (4 cl., 4 q.h. This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology Degree programs.)

An introduction to mechanics: units of measurement, vectors, accelerated motion, and Newton's laws of motion. *Prereq.* none.

11.302 Introductory Physics II (4 cl., 4 q.h. This credit cannot be used in the Associate in Engineering, Associate in Science, or the Bachelor of Engineering Technology Degree programs.)

Continuation of mechanics: conservation of energy and momentum. Introduction to elements of heat, thermodynamics, light, and electromagnetism. *Prereq.* 11.301.

***11.304 General Physics I** (2 cl., 2 q.h.)

Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; conservation laws of energy and momentum. *Prereq.* 10.327 or concurrently.

***11.305 General Physics II** (2 cl., 2 q.h.)

Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; Elasticity and Simple Harmonic Motion; Rotational Motion; Fluids at REST in motion. *Prereq.* 11.304.

***11.306 General Physics III** (2 cl., 2 q.h.)

Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits; properties of light; simple optical systems. *Prereq.* 11.305.

11.317 Physics I (Mechanics) (4 cl., 4 q.h.)

Vectors and balanced forces; accelerated motion; Newton's laws; projectile motion;

work and energy; momentum; angular motion; centripetal force; rotation of rigid bodies; moment of inertia. *Prereq. 10.307 or concurrently.*

11.318 Physics II (Properties of Matter, Heat, Wave Motion, Sound, Light)
(4 cl., 4 q.h.)

Elasticity; density and pressure; temperature; the gas laws; heat; expansion; heat transfer; thermodynamics; vibratory motion; wave motion; properties of sound; properties of light. *Prereq. 11.317.*

11.319 Physics III (Electricity, Magnetism) (4 cl., 4 q.h.)

Electrostatics; circuit elements; direct current circuits; magnetism; electromechanical devices; alternating current circuits; electronics; electromagnetic waves. *Prereq. 11.318.*

11.320 Semiconductor Physics & Devices (4 cl., 4 q.h.)

Properties of atoms and electrons as related to conduction of electricity in solids; energy-band of semiconductors; nature of pn junctions; diode characteristics; electrons and holes; application of diodes; transistor theory, characteristics, construction and operation; Zener and Avalanche breakdown; Zener specifications and performance; tunnel diode characteristics and parameters; field-effect transistors; photomultipliers and photodiodes; LED's and Liquid-Crystal devices; piezoelectric devices; integrated circuits; electron tube theory. (This is a combination of 11.322 and 11.323.) *Prereq. 11.319.*

11.321 Wave Phenomena (2 cl., 2 q.h.)

Application of fundamental principles of waves to electromagnetic radiation; waves on transmission lines including the use of Smith Charts; selected topics in radar, TV transmission, citizen band systems, pertaining to electromagnetic wave transmission. *Prereq. 11.319 or 11.316.*

11.322 Semiconductor Physics (2 cl., 2 q.h.)

Properties of atoms and electrons as related to conduction of electricity in solids; energy-band of semiconductors; nature of pn junctions; diode characteristics; electrons and holes; application of diodes; transistor theory, characteristics, construction, and operation. *Prereq. 11.319.*

11.323 Semiconductor Devices (2 cl., 2 q.h.)

Zener and Avalanche breakdown; Zener specifications and performance; tunnel diode characteristics and parameters; field-effect transistors; photomultipliers and photodiodes; LED's and liquid-crystal devices; piezoelectric devices; integrated circuits; electron tube theory. *Prereq. 11.322.*

11.324 Introductory Survey of Lasers (2 cl., 2 q.h.)

Physical principles and technology will be emphasized. Course will include a review of the fundamental concepts of light and spectroscopy, the basic theory of lasers, studies of solid state; atomic, ionic and molecular gas; organic dye; and semiconductor lasers. Related optics and detection will be discussed. *Prereq. 11.319.*

11.331 Modern Physics I (2 cl., 2 q.h.)

Introduction to theory of relativity; mass and binding energy; photoelectric effect; De Broglie hypothesis; wave-packet of particles; Schrodinger wave equation; Bohr theory of the atom. *Prereq. 11.306 or 11.319.*

11.332 Modern Physics II (2 cl., 2 q.h.)

Quantum theory of hydrogen atom; Pauli's exclusion principle; the Zeeman effect; structure of molecules, Laser theory; semiconductor theory and devices. *Prereq.* 11.331.

11.333 Modern Physics III (2 cl., 2 q.h.)

Properties of nucleus; alpha, beta and gamma theory; nuclear reactions; fusion and thermonuclear energy; introduction to elementary particles; eightfold way; quarks; and J particles. *Prereq.* 11.332.

11.373 Physics Laboratory I (2½ cl., 2 q.h.)

First quarter of a two-quarter physics laboratory. Experiments in mechanics, fluid dynamics, and gas laws. *Prereq.* 11.305 or 11.318, or concurrently.

11.374 Physics Laboratory II (2½ cl., 2 q.h.)

A continuation of 11.373. Experiments in wave motion, optics, and electrical circuits.

11.401 Man's Physical Environment I (2 cl., 2 q.h.)

(See General Interest Courses, page 157.)

11.402 Man's Physical Environment II (2 cl., 2 q.h.)

(See General Interest Courses, page 157.)

11.417 Physics I (Mechanics) (4 cl., 4 q.h.)

(Day Curriculum)

Kinematics and dynamics of particle motion; Newton's laws; projectile and circular motion; conservation laws for momentum and energy; rational motion; simple harmonic motion. *Prereq.* 10.407 or concurrently.

11.418 Physics II (Properties of Matter, Heat, Wave Motion, Sound, Light)

(4 cl., 4 q.h.)

(Day Curriculum)

Elasticity; density and pressure; temperature; expansion; heat; change of state; heat transfer; vibrating systems; wave motion; properties of sound; properties of light. *Prereq.* 11.417.

11.419 Physics III (Electricity, Magnetism) (4 cl., 4 q.h.)

(Day Curriculum)

Electrostatics; circuit elements; direct current circuits; magnetism; electromechanical devices; alternating current circuits; electronics; electromagnetic waves. *Prereq.* 11.418.

11.420 Physics IV (4 cl., 4 q.h.)

(Day Curriculum)

Electronics; electromagnetic waves; properties of light; optical devices; modern physics; atoms and nuclei. *Prereq.* 11.319.

CHEMISTRY

Students wishing to elect other chemistry courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

12.407 Modern Chemistry I (Introduction to Inorganic Chemistry) (2 cl., 2.4 lab., 3 q.h.)

Fundamental ideas of matter and energy, chemical bonding, chemical energy, water and solutions, colloids, ionic reactions, oxidation and reduction, acidity, radio-

activity, air and water pollution. All topics discussed from the viewpoint of recent developments. The laboratory deals with experiments related to the lecture material. (Laboratory fee)

12.408 Modern Chemistry II (Introduction to Organic Chemistry) (2 cl., 2.4 lab., 3 q.h.)

Classes of organic compounds, including hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines, amides, and carbohydrates, including their relationship with modern biology. The laboratory deals with experiments related to the lecture material. *Prereq.* 12.407 or equiv. (Laboratory fee)

12.409 Modern Chemistry III (Introduction to the Chemistry of Living Bodies) (2 cl., 2.4 lab., 3 q.h.)

Includes fats, proteins, enzymes, chemistry of digestion, and the chemical reactions of body fluids. The laboratory deals with experiments related to the lecture material. *Prereq.* 12.408 or equiv. (Laboratory fee)

12.415 Biochemistry I (3 cl., 3 q.h.)

The first quarter of a three quarter sequence. The sequence covers introduction to the biochemistry of the cell, including the occurrence, chemistry, and metabolism of carbohydrates, lipids, proteins, and nucleic acids. *Prereq.* 12.433 or equiv.

12.416 Biochemistry II (3 cl., 3 q.h.)

Continuation of Biochemistry I. *Prereq.* 12.415 or equiv.

12.417 Biochemistry III (3 cl., 3 q.h.)

Continuation of Biochemistry II. *Prereq.* 12.416 or equiv.

12.421 Analytical Chemistry I (2 cl., 2.4 lab., 3 q.h.)

Analytical procedures and techniques. Principles and practice of gravimetric methods of analysis. Laboratory work involves procedures and techniques of gravimetric analysis. *Prereq.* 12.456 or equiv. (Laboratory fee)

12.422 Analytical Chemistry II (2 cl., 2.4 lab., 3 q.h.)

Principles and practice of titrimetric methods of analysis. The laboratory work involves the procedures and techniques of volumetric analysis. *Prereq.* 12.421 or equiv. (Laboratory fee)

12.423 Analytical Chemistry III (2 cl., 2.4 lab., 3 q.h.)

Theories of spectrophotometry, chromatography, and selected electroanalytical methods. The laboratory involves instruments and procedures for electrometric and optical methods of chemical analysis. *Prereq.* 12.422 or equiv. (Laboratory fee)

12.431 Organic Chemistry I (2 cl., 4 lab. and disc., 4 q.h.)

Nature of carbon in organic compounds. General principles of structure, nomenclature, preparation, uses, and reactions of aliphatic hydrocarbons: alkanes, alkenes, alkynes, dienes, cycloalkanes. Position and geometric isomerism. Introduction to free radical and ionic mechanisms of reactions. The laboratory deals with the preparation and properties of compounds discussed in lecture. *Prereq.* 12.456 or equiv. (Laboratory fee)

12.432 Organic Chemistry II (2 cl., 4 lab. and disc., 4 q.h.)

Structure of benzene, electrophilic aromatic substitution reactions. General principles of structure, nomenclature, preparation, uses, and reactions of the various types of organic compounds, including: alcohols, alkyl and aryl halides, ethers and epoxides, and carboxylic acids. Optical isomerism and introductory chemical kinetics will be discussed. The laboratory deals with the preparation and properties of compounds discussed. *Prereq. 12.431 or equiv.* (Laboratory fee)

12.433 Organic Chemistry III (2 cl., 4 lab. and disc., 4 q.h.)

Continuation of 12.432 with emphasis on the application of chemical conversions to synthetic problems. Functional derivatives of carboxylic acids, sulfonic acids and their derivatives, amines, diazonium compounds, phenols, aldehydes, and ketones. The laboratory deals with the preparation and properties of compounds discussed. *Prereq. 12.432 or equiv.* (Laboratory fee)

12.441 Physical Chemistry I (3 cl., 3 q.h.)

Thermodynamics, thermochemistry, First and Second Laws, entropy and free energy in spontaneous processes. *Prereq. 10.323, 11.306, and 12.446 or equiv.*

12.442 Physical Chemistry II (3 cl., 3 q.h.)

Chemical equilibria, acids and bases, electrochemistry, colligative properties, phase diagrams, thermodynamics of multicomponent systems, Kinetic molecular theory. *Prereq. 12.441 or equiv.*

12.443 Physical Chemistry III (3 cl., 3 q.h.)

Kinetics, quantum chemistry, photochemistry. *Prereq. 12.442 or equiv.*

12.444 General Chemistry I (2 cl., 2.4 lab, 3 q.h.)

Fundamental concepts: symbols, formulas, equations, atomic weights, and calculations based on equations. Gases, liquids, solutions, and ionization. The laboratory deals with experiments related to the lectures. *Prereq. 10.327 or equiv. (or taken concurrently).* (Not open to those students with credit for 12.311 or 12.314.) (Laboratory fee)

12.445 General Chemistry II (2 cl., 2.4 lab, 3 q.h.)

Atomic structure, bonding, and molecular structure. Oxidation and reduction reactions, equilibrium and kinetics. The laboratory deals with experiments related to the lectures. *Prereq. 12.444 or equiv.* (Not open to those students with credit for 12.312 or 12.315.) (Laboratory fee)

12.446 General Chemistry III (2 cl., 2.4 lab, 3 q.h.) (Laboratory Fee)

Thermochemistry and electrochemistry. Acids, bases, and solubility product. Nuclear chemistry. Introductory organic chemistry and biochemistry. The laboratory deals with experiments related to the lectures. *Prereq. 12.445 or equiv.* (Not open to those students with credit for 12.313 or 12.316.)

12.451 Instrumental Analysis I (formerly Instrumental and Radiochemistry I) (3 cl., 3 q.h.)

Basic theory and instruments used in electrochemical analysis. Course includes such topics as electrode and cell potentials, potentiometric titrations, direct potentiometry

(pH meters and specific ion electrodes), coulometry, polarography, amperometry, electrogravimetry, and conductivity. *Prereq.* 12.423 or *equiv.* (This course and 12.452 can serve as preparation for certain graduate courses.)

12.452 Instrumental Analysis II (formerly Instrumental and Radiochemistry II) (3 cl., 3 q.h.)

Basic theory and instruments used in spectrochemical analysis. Course includes such topics as electromagnetic spectrum, ultraviolet and visible spectrophotometry, infrared spectrophotometry, X-ray analysis, fluorescence and phosphorescence, emission spectrophotometry, absorption spectrophotometry, and chromatography. *Prereq.* 12.451 or *equiv.* (This course and 12.451 can serve as preparation for certain graduate courses.)

12.453 Radiochemistry (formerly Instrumental and Radiochemistry III) (3 cl., 3 q.h.)

Radioactivity and nuclear reactions; production and study of nuclear reactions; equations of radioactive decay; nuclear states and radioactive processes; interaction of radiation with matter; radiation detection and measurement; statistics of radioactivity measurements; techniques for the study of radionuclides; tracers in chemical applications; and nuclear energy. *Prereq.* 12.452 or *equiv.*

12.460 Chemistry Workshop (1.5 cl., 0 q.h., given twice weekly)

A discussion and problem-solving session which will reinforce and reexamine the material covered in 12.444, 12.445, and 12.446. Content is programmed according to needs of the students, and the classes are small and informal.

EARTH SCIENCE

Students wishing to elect other earth science courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

16.331 Principles of Oceanology I (3 q.h.)

Introduction to the origin of the global ocean; the physical and chemical properties of sea water; development of ocean currents and their effect on land masses of the world; problems of ocean pollution. *Prereq.* 16.303 or *equiv.*

16.332 Principles of Oceanology II (3 q.h.)

The habitat zones and organisms of the sea; Phytoplankton, zooplankton, and nekton; economic importance of marine resources for expanding world population. *Prereq.* 16.331 or *equiv.*

16.333 Principles of Oceanology III (3 q.h.)

Physiography and structure of ocean basins; marine geological processes and features; sedimentation, erosion, shorelines, and bottom topography; methods and techniques of marine geological explorations. *Prereq.* 16.332 or *equiv.*

BIOLOGY

Students wishing to elect other biology courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

18.407 Gross Anatomy and General Physiology I (3 cl., 3 q.h.)

Fundamental concepts of living organisms; chemical and biological characteristics of cellular metabolism; the skeletal system and its appendages; general nomenclature, anatomical names and terms. *Prereq. none.*

18.408 Gross Anatomy and General Physiology II (3 cl., 3 q.h.)

The systems of the body and the relationships between them; the structure and function of each. *Prereq. 18.407 or equiv.*

18.409 Gross Anatomy and General Physiology III (3 cl., 3 q.h.)

Continuation of the systems of the body and the relationship between them. *Prereq. 18.408 or equiv.*

18.411 Biology I (General) (3 cl., lab., 4 q.h.)

(Laboratory Fee)

Universal properties and processes of living organisms; cellular composition and cellular activities; inheritance and cellular control. *Prereq. none.*

18.412 Biology II (Animal) (3 cl., 3 lab., 4 q.h.)

(Laboratory Fee)

Functional anatomy of animal organ systems, their interactions and environmental relationships. *Prereq. 18.411 or equiv.*

18.413 Biology III (Animal) (3 cl., 3 lab., 4 q.h.)

(Laboratory Fee)

Systematic comparative study of the structure and functions of animals. Diversity of animals considered from the standpoint of evolutionary adaptation. *Prereq. 18.412 or equiv.*

18.421 Microbiology I (2 cl., 3 lab., 3 q.h.)

(Laboratory Fee)

Morphology and biochemistry of the bacteria. *Prereq. 18.413 or equiv.*

18.422 Microbiology II (2 cl., 3 lab., 3 q.h.)

(Laboratory Fee)

Survey of pathogenic microorganisms. *Prereq. 18.421 or equiv.*

18.423 Microbiology III (2 cl., 4 lab., 3 q.h.)

(Laboratory Fee)

Biology of the protista; the role of microorganisms in the environment and industry. *Prereq. 18.422.*

18.424 Human Anatomy and Physiology I (2 cl., 2 lab., 3 q.h.)

(Laboratory Fee)

Introduction to human anatomy: osteology, anatomy of the muscular system, respiratory system, digestive system, the vascular systems, urogenital system. The laboratory includes a study of human bones and cat dissection. *Prereq. 18.406 or 18.413 or equiv.*

18.425 Human Anatomy and Physiology II (2 cl., 2 lab., 3 q.h.)

(Laboratory Fee)

Principles of physiology and continuation of the study of human anatomy. The laboratory is mainly concerned with muscle physiology. *Prereq. 18.424 or equiv.*

18.426 Human Anatomy and Physiology III (2 cl., 2 lab., 3 q.h.) (Laboratory Fee)
Continuation of the principles of physiology. The anatomy and physiology of the nervous system, physiology of the endocrine system. The laboratory deals with physiology of respiration and the physiology of blood. *Prereq.* 18.425 or equiv.

18.461 Ecology I (3 cl., 3 q.h.)

Environmental factors; the soil system; water; the atmosphere; temperature, light, wind, pressure; the physico-chemical factors—CO₂, N, and mineral nutrients; habitat; distribution of plants and animals in the world according to temperature and precipitation. *Prereq.* 18.413 or equiv.

18.462 Ecology II (3 cl., 3 q.h.)

The ecosystem; ecological niche; the producers, consumers, and decomposers; the pond ecosystem, desert ecosystem, forest ecosystem, and sea shore ecosystem; energy cycle and efficiency of energy utilization; mass, weight, and energy pyramids. *Prereq.* 18.461 or equiv.

18.463 Ecology III (3 cl., 3 q.h.)

Population ecology; biotic community; population growth; relations between the species; symbiosis; competition; predation; succession. *Prereq.* 18.462 or equiv.

18.464 Man and His Biosphere I (3 cl., 3 q.h.)

An ecological analysis of the human situation and man's interaction with other organisms; the necessary foundation of biological principles will be presented.

18.465 Man and His Biosphere II (3 cl., 3 q.h.)

A continuation of Man and Environment I. *Prereq.* 18.564 or equiv.

LIBERAL ARTS

Students wishing to elect other humanities, social science, and natural science courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

19.301 Psychology I (3 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning. *Prereq.* none.

19.302 Psychology II (3 q.h.)

Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. *Prereq.* 19.301 or equiv.

19.303 Psychology III (3 q.h.)

Personality theory and measurement, behavior disorders, mental health, and psychotherapy. *Prereq.* 19.302 or equiv.

19.307 Psychology (Intensive) (9 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning; principles of sensory processing, perception, motivation and emotion, and social influences on

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behavior; personality theory and measurement, behavior disorders, mental health, and psychotherapy. (*Not open to students who have taken 19.301, 19.302, 19.303.*) *Prereq. none.*

19.308 Fundamentals of Psychology I (4 q.h.)

Basic concepts from most areas of psychological investigation; the experimental orientation to the study of behavior, including child development, individual differences, learning, and social psychology. (Recommended for psychology majors.) (*Not open to students who have credit for 19.301, 19.302, 19.303.*)

19.309 Fundamentals of Psychology II (4 q.h.)

The sensory basis of behavior, cognition, perception, motivation, emotions, normal, and abnormal personality. (Recommended for psychology majors.) (*Not open to students who have credit for 19.301, 19.302, 19.303.*) *Prereq. 19.308 or equiv.*

21.301 Sociology I (3 q.h.)

Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family. Course materials require competency in reading and writing skills.

21.302 Sociology II (3 q.h.)

A continuation of Sociology I, with major emphasis on primary groups, associations, social stratification, collective behavior, and population. Term papers or essays may be required. *Prereq. 21.301 or equiv.*

21.303 Sociology III (3 q.h.)

A continuation of Sociology II, focusing on the major institutional areas, with particular attention to problems of social, political, urban, and industrial change. *Prereq. 21.302 or equiv.*

21.304 Sociology (Intensive) (9 q.h.)

Basic concepts and theories relating to the study of man as a participant in group life, with emphasis on social structure, culture, socialization, and the family; primary groups, associations, social stratification, collective behavior, and population; the major institutional areas, with particular attention to problems of social, political, urban, and industrial change. Term papers or essays may be required. (*Not open to students who have taken 21.301, 21.302, 21.303.*)

21.401 Principles of Sociology I (4 q.h.)

An intensive introduction to basic concepts and theories relating to the study of humans as a participant in group life. Emphasis is placed on socialization, culture, social structure, primary groups, family, social stratification, and population. (*Not open to students with credit for 21.302 or 21.303*)

21.402 Principles of Sociology II (4 q.h.)

A continuation of Principles of Sociology I, with emphasis on a critical analysis of American society, with particular attention to problems of social, political, urban, and industrial change. *Prereq. 21.401 or equiv.* (*Not open to students with credit for 21.302 or 21.303.*)

23.301 History of Civilization I (3 q.h.)

The beginnings of Western Civilization with emphasis on the political, economic, and social history of ancient and medieval times to 1300.

23.302 History of Civilization II (3 q.h.)

Early Modern Europe from 1300 to 1789, with an examination of the two major intellectual movements, the Renaissance and the Enlightenment, and their impact on the rise of national states, capitalism, and Protestantism.

23.303 History of Civilization III (3 q.h.)

Modern Europe from 1789 to the present, emphasizing the rise of ideology in a technological age.

27.341 Drawing I (3 q.h.)

Practice in the techniques and development of drawing in pencil and pen and ink, with concentration on basic drawing problems.

27.342 Drawing II (3 q.h.)

Practice in the techniques of wash drawing, scratch board drawing, and mixed medias. *Prereq. 27.341 or equiv.*

27.343 Drawing III (3 q.h.)

Study of human anatomy and the practice of figure drawing and composition. *Prereq. 27.342 or equiv.*

30.301 English for International Students I (non-credit)

An introduction to the grammar and rhetoric of English as a second language. Practice in listening, speaking, and writing, with selected readings and exercises for vocabulary and pronunciation.

30.302 English for International Students II (non-credit)

An intermediate course in English as a second language. Practice in preparing written and oral reports, including business and social letters. *Prereq. 30.301 or equiv.*

30.303 English for International Students III (non-credit)

An advanced course in English as a second language. Practice in special forms of writing to broaden diction, syntax, and organizational techniques. *Prereq. 30.302 or equiv.*

30.304 Elements of Writing (formerly 30.600) (3 q.h.)

An intensive review of grammatical forms and structural patterns of current English. Practice in writing sentences, paragraphs, and short papers.

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course designed to upgrade the student's background.

30.305 English I (3 cl., 3 q.h.)

A detailed examination of the modes of rhetoric, especially exposition and argument. Practice in writing short papers based upon readings of expository prose. *Prereq. none.*

30.306 English II (3 cl., 3 q.h.)

A detailed examination of the modes of rhetoric, especially description and narration. Practice in writing short papers and a fully documented library paper based upon readings of fiction. *Prereq.* 30.305.

30.307 English III (3 cl., 3 q.h.)

The development of techniques for understanding imaginative literature. Practice in writing short papers and a fully documented library paper based on readings of poetry and drama. *Prereq.* 30.306.

30.113 Freshman Writing (4 cl., 4 q.h.)

(Day Curriculum)

Important principles of logic and rhetoric applied to exposition and argumentation writing; review of sentence structure, punctuation, and paragraphing; extensive reading and analysis of the essay form; theme assignments.

30.114 Introduction to Literature (4 cl., 4 q.h.)

(Day Curriculum)

An introduction to literary forms: poetry, prose fiction, and drama; intensive reading in various forms and discussion of different approaches to literature. *Prereq.* 30.113.

30.115 Great Themes in Literature (4 cl., 4 q.h.)

(Day Curriculum)

Content determined by instructor, who chooses a theme and a number of books from different periods to illustrate it. Examples: The Hero in Literature, Visions of Utopia, Science Fiction, etc. *Prereq.* 30.114.

BUSINESS MANAGEMENT

Students wishing to elect other business courses should refer to the University College Catalogue and petition for approval by the Committee on Education of Lincoln College.

39.115 Principles and Problems of Economics (4 cl., 4 q.h.)

(Day Curriculum)

An introduction to the conceptual aspects of economics; the flow of national income; economic growth and fluctuation; the role of money and banking; monetary and fiscal policies. Emphasis on developing conceptual tools for use in the analysis of economic problems facing modern society.

39.301 Economic Principles and Problems I (3 q.h.)

Development of macroeconomic analysis; review of national income concepts; national income determination, fluctuation, and growth; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade; balance of international payments. *Prereq.* none.

39.302 Economic Principles and Problems II (3 q.h.)

The role of a market pricing system, supply and demand, in determining the allocation of resources to competing uses and why this system may not function adequately in certain areas. Application of economic principles to private and public problems in such areas as pollution, poverty, and racial discrimination. *Prereq.* 39.301 or equiv.

39.303 Economic Principles and Problems III (3 q.h.)

Applications of economic principles to selected problem areas; poverty, competition, labor, agriculture, urban. *Prereq.* 39.302 or equiv.

39.311 Statistics I (3 q.h.)

Introduction to the collection and organization of data; concentration on the nature, computation, and uses of measures of central tendency and variability. *Prereq. 39.303 or equiv.*

39.312 Statistics II (3 q.h.)

Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution, and chi square. *Prereq. 39.311 or equiv.*

39.313 Statistics III (3 q.h.)

Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment, and index numbers. *Prereq. 39.312 or equiv.*

39.314 Statistics (Intensive) (9 q.h.)

Introduction to the collection and organization of data; concentration on the nature, computation, and uses of measures of central tendency and variability; introduction to statistical inference, parameters of samples, tests of significance, "t" distribution and chi square; introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment and index number. *(Not open to students who have taken 39.311, 312, 313.) Prereq. 39.303 or equiv.*

41.301 Accounting Principles I (3 q.h.)

The basic concepts and methodology of accounting for service and merchandising businesses, and accounting for business assets. *(Offered every quarter on all campuses) Prereq. none.*

41.302 Accounting Principles II (3 q.h.)

Emphasizes financial reporting, income measurement, valuation and appraising the financial results of business operations. Replaces 41.501, 41.502, 41.503. *Prereq. 41.301.*

41.304 Accounting Principles (Intensive) (6 q.h.)

Same as Accounting Principles I and II. Replaces 41.541.

45.301 Management and Organization I (3 q.h.)

To introduce the new business person to the setting and general structure of American business which includes objectives and practices as they affect the American standard of living; the characteristics of private enterprise, and the nature and challenge of capitalism and other forms of economic enterprise. The student is introduced to the forms of business, both large and small; to the structures of organizations; the career of the management as they tend to organizations involves; what must be faced; and what decisions must be reached.

45.302 Management and Organization II (3 q.h.)

To introduce the business person to methodologies in planning, organizing, directing, and controlling the functions of production, marketing, sales, and pricing as they relate to the American free enterprise systems as contrasted to other systems of international business. Examination of modern, effective, and proven tools and techniques for coping with the myriad interrelationships and intricacies of systems management. Develops a more comprehensive understanding of the total structure of business and other enterprises. *Prereq. 45.301.*

45.303 Principles and Practices of Management (3 q.h.)

Takes the student from definitions and fundamentals of business to basic concepts relating to the functions of management and to the analytical techniques which are necessary to successful decisionmaking. Emphasizes that management is a continuous process of action by involving the student in "how to" design an organization, understand and deal with people, evaluate the political, social, and economic environment, effectively plan, direct, and control the organization. Short cases and professional articles, included in the text, provide provocation material for discussion and reinforcement of management concepts. *Prereq.* 45.301.

48.301 Elements of Transportation (3 q.h.)

An introduction to regulatory, economic, and management aspects of transportation from the viewpoint of shippers, government, and carrier management. Topics include: cost, rates, operations, entry, mergers, and intercity passenger carriage. A course of general interest to students of business, law, or government.

48.302 Physical Distribution Management (3 q.h.)

An introduction to the physical distribution management concept. Topics include inventory control, warehousing, cost control, and locational strategy. Course uses text and case materials developed from industry situations.

48.303 Organization and Control of Physical Distribution Management (3 q.h.)

Establishment of the firm's physical distribution organization. Interrelationships with other company functions. Examination of advanced physical distribution problems.

48.304 Management of Warehouse Operations (3 q.h.)

A practical course in the management of warehouses. Topics include: site selection, construction, finance, operations, measurement of performance, and warehouse technology.

48.305 Traffic Management I—Rates and Tariffs (3 q.h.)

A practical course in the interpretation and use of tariffs. Topics include classifications, rate scales, tariff rules, rate-making procedures, and ICC law and practice.

48.306 Traffic Management II—Selected Topics (3 q.h.)

Further study of traffic management covering such topics as routing, claims, insurance, consolidation, and packaging. *Prereq.* 48.305.

48.307 Contemporary Issues in Transportation and Distribution (3 q.h.)

This course focuses attention on a limited number of topics which are of particular interest during the current academic year.

48.308 Transportation Regulation and Promotion I (3 q.h.)

Study of the history and content of the Interstate Commerce Act.

48.309 Transportation Regulation and Promotion II (3 q.h.)

Study of administrative law and procedures, the code of ethics, and general rules of practice. Analysis of cases pertinent to the Commerce Clause. Preparation for the ICC Practitioners Exam. *Prereq.* 48.308.

48.310 Surface Transportation I—Railroad Management (3 q.h.)

A management-oriented course that considers the current and future status of the railroads. Topics include: investment and finance, mergers, marketing, labor relations, diversification, and public policy.

48.311 Surface Transportation II—Motor Carrier Management (3 q.h.)

A management-oriented course that examines the regulated motor carrier industry. Topics include: equipment selection, finance, mergers, marketing, labor relations, routes, operations and control, and public policy.

48.312 Surface Transportation III—Marine Transportation (3 q.h.)

A management-oriented course that examines the U.S. Merchant Marine. Topics include: international trade patterns, government promotion and regulation, technological innovations, port facilities, and labor relations.

48.313 Surface Transportation IV—Private Trucking (3 q.h.)

Beginning a private trucking operation. Topics include: legal guidelines, purchase versus lease, operations, and performance measurement.

48.314 Air Transportation (3 q.h.)

Economics and regulation of Civil Aeronautics Board certified air carriage. Topics include: entry, operations, pricing, mergers, cost analysis, and financing.

48.315 Urban Transportation (3 q.h.)

The scope and status of transportation in our metropolitan area. Examination of the planning and financing of urban transportation systems. The role of local, state, and federal government units. The problems of transit management.

48.316 Carrier Management (3 q.h.)

The transportation system from the carrier viewpoint; managerial response to a heavily regulated and rapidly expanding environment; focus on carrier decision making including routes, scheduling, financing, and pricing of services.

SUPPLEMENTAL COURSES

93.305 Survival Training (2 cl., 2 q.h.)

Training in and demonstration of modern techniques of human survival; methods in the wilderness environment. *Prereq. none.*

93.401 Technical Communications (4 cl., 4 q.h.)

(Aviation Program)

Thought organization and effective sentences; written reports and instruction manuals; specifications and proposals; graphic aids and reproduction processes. *Prereq. 30.602.*

93.402 Technical Communications I (2 cl., 2 q.h.)

Thought organization and effective sentences; written reports and instruction manuals. *Prereq. 30.602.*

93.403 Technical Communications II (2 cl., 2 q.h.)

Specifications and proposals; graphic aids and reproduction processes. *Prereq.* 93.402.

93.404 Technical Communications (3 q.h.)

Thought organization and effective sentences; written reports and instruction manuals; specifications and proposals; graphic aids and reproduction processes. *Prereq.* 30.306, or 30.304 and 30.305.

AVIATION TECHNOLOGY

96.307 Introduction to Aircraft Design (1 cl., 2 lab., 2 q.h.)

Basic orthographic principles and interpretations of aircraft design; a presentation of basic aerodynamics, structural characteristics of aircraft, materials, and manufacturing processes. Laboratory work will involve aircraft construction. *Prereq.* 10.391 and 11.391.

96.308 Aircraft Power & Systems (4 cl., 4 q.h.)

Engine types, nomenclature, and engine development; engine cycles and principles, performance, power and its measurement, ratings; design and construction of parts and their functions; valve mechanisms and timing; cooling system, carburation, fuel system, ignition system, lubrication, and oil system design; hydraulic, pneumatic, electrical and mechanical systems; landing gear types, design, loads and limitations; landing gear retraction systems; general flight control systems including rudder, elevator, aileron, and flaps; loads and limitations de-icer systems for flight surfaces, propeller, and engine breathing systems; cabin pressure and oxygen systems; air-speed and general air-driven instrument systems. *Prereq.* none.

96.309 Introduction to Aerodynamics (1 cl., 1 q.h.)

A non-calculus presentation of basic fluid dynamics and principles of fluid flow. Includes continuity, Bernoulli, and momentum equations; streamlines, stream tubes, drag, theory of lift, wing theory, vortex flow, ground effect, stalls, boundary layer, flow separation, control surfaces, stability, and balance. *Prereq.* 10.308 and 11.318 or concurrently.

96.310 Basic Helicopter Aerodynamics (2 cl., 2 q.h.)

General aerodynamics; helicopter components and their functions; loads and load factors; gyroscopic precession principle; performance; introduction to flight manual, helicopter operations in confined areas, precautionary measures and critical conditions. *Prereq.* 96.392.

96.311 Aviation Meteorology I (2 cl., 2 q.h.)

A survey of the principles of meteorology and structure of the atmosphere; meteorological instruments and observations. *Prereq.* 11.306 or equiv.

96.312 Aviation Meteorology II (2 cl., 2 q.h.)

Weather map interpretation and common aviation weather teletype codes; physical approach to pressure, temperature, basic thermodynamics, stability, and cloud formations. *Prereq.* 96.311.

96.313 Climatology (2 cl., 2 q.h.)

Climate causes and effects; climatology of several regions of the world; application of climatology to problems of airport location and construction, airline operation, and private flying. *Prereq.* 96.312.

96.321 Avionics I (2 cl., 2 q.h.)

Review of basic electronic principles, hazards, aircraft electrical systems, FCC regulations, selection, installation, and service of avionics, strobe lights, radio communications. *Prereq.* 03.309 or 03.395.

96.322 Avionics II (2 cl., 2 q.h.)

Antennas, ADF, omni, localizer, marker beacon, audio systems, transponders. *Prereq.* 96.321.

96.323 Avionics III (2 cl., 2 q.h.)

Glide slope, DME, RNAV radar, INAV, autopilots. *Prereq.* 96.322.

96.324 Introductory Avionics (4 cl., 4 q.h.)

Basic coverage of electronics including: vacuum tube principles, semiconductor physics principles, power supplies, amplifiers, oscillators, and pulse circuits; generator and motor principles and applications; basic concepts of avionics, electrical hazards, aircraft electrical systems, electrical instruments, strobe lights, FCC regulations, radio communications, and antennas. *Prereq.* 11.319.

96.325 Avionics (4 cl., 4 q.h.)

Selection, installation, and servicing of avionics, automatic direction finders, marker beacons, omnirange and localizers, audio switching systems, ATC transponders, glide slope systems, distance measuring equipment, autopilots, and radar. *Prereq.* 96.324.

96.334 Private Flight Laboratory (8 lab., 4 q.h.)

This course consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the private pilot certificate, airplane rating, single engine. *Prereq.* Class I or II medical certificate.

96.335 Instructional Flight Laboratory (6 lab., 3 q.h.)

This course consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight instructor certificate, airplane rating, single engine. *Prereq.* 96.338.

96.336 Instrument Instructor Laboratory (4 lab., 2 q.h.)

This course consists of necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the instrument flight instructor rating, airplane, single engine. *Prereq.* 96.335.

96.338 Commercial Flight Lab. (16 lab., 8 q.h.)

This course consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the commercial pilot certificate, airplane rating, single engine. *Prereq.* 96.334.

96.339 Instrument Flight Lab. (8 lab., 4 q.h.)

This course consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the instrument rating, airplane. *Prereq.* 96.334, 96.338.

96.340 Multi-Engine Flight Lab. (2 lab., 1 q.h.)

This course consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the multi-engine rating, airplane. *Prereq.* 96.334.

96.354 Principles of Flight Instruction (2 cl., 2 q.h.)

Fundamentals and principles of instructing; learning concepts of teacher-student communications; use of special flight teaching aids and training procedures. *Prereq.* 96.345 or equivalent test.

96.353 Flight Operations Seminar (3 q.h.)

This course discusses complex topics pertaining to such areas as the air traffic system, aircraft operation, and weather. The course content will generally be flexible to satisfy the participant's demand for solutions to problem areas. Experts in various fields will generally be employed as guest lecturers to enhance the course. *Prereq.* 96.394, *Advanced Air Science B* or *Commercial Flight rating* or equivalent.

96.358 Helicopter A (2 lab., 2 q.h.)

This course in conjunction with part B consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the helicopter rating. *Prereq.* *Commercial Fixed Wing License; Class I or II medical certificate.*

96.359 Helicopter B (2 lab., 2 q.h.)

This course in conjunction with part A consists of the necessary flight training and instruction to satisfy the minimum Federal Aviation Administration requirements to apply for the flight test for the helicopter rating. *Prereq.* 96.358.

96.360 Aircraft Analysis I (2 cl., 2 q.h.)

A presentation of subsonic aerodynamics and structural characteristics of aircraft. *Prereq.* 11.317.

96.363 General Aviation Operations I (2 cl., 2 q.h.)

A presentation of the major functions of airport management—organization, zoning, adequacy, financing, revenues and expenses, evaluation, and safety; the airport and its socioeconomic effect on the community. *Prereq.* none.

96.364 General Aviation Operations II (2 cl., 2 q.h.)

Study and analysis of airport functions, such as fixed base operators, pilot training schools; airtaxi operations in both charter and schedule activities. *Prereq.* 96.363.

96.365 General Aviation Operations III (2 cl., 2 q.h.)

A continuation through case studies of general aviation operations. *Prereq.* 96.364.

96.366 General Aviation Operations (Intensive) (6 q.h.)

A presentation of the major functions of airport management—organization, zoning, adequacy, financing, revenues and expenses, evaluation, and safety; the airport and its socioeconomic effect on the community; study and analysis of airport functions, such as fixed base operators, pilot training schools; airtaxi operations in both charter and schedule activities.

96.367 Intermodal Transportation (3 cl., 3 q.h.)

An overview of the major aspects of each segment of transportation—air, rail, maritime, bus, truck, and transit. The course also probes the interrelationship between the major modes of transportation.

96.370 Air Cargo Practices A (3 cl., 3 q.h.)

Study of airline and air freight forward cargo practices with emphasis on regulation, economics, marketing, and handling and organizational aspects. *Prereq. none.*

96.371 Air Cargo Practices B (3 cl., 3 q.h.)

A continuation through case studies of air cargo operations. *Prereq. 96.370.*

96.372 Airline Traffic and Sales A (3 cl., 3 q.h.)

Functions of the traffic and sales department; relationship between the travel agencies and the airlines; relationships with other carriers; reservations and the procedures involved in the transportation of one passenger of NCA and another carrier; airlines promotion; the reservation agent and training. *Prereq. none.*

96.373 Airline Traffic and Sales B (3 cl., 3 q.h.)

Tariffs and schedules with an explanation of how flight times are established; flight frequencies; new routes; and the establishment of ticket fares; aspects of cargo and charters. *Prereq. 96.372.*

96.376 General Aviation Operations A (3 cl., 3 q.h.)

A presentation of the major functions of airport management; organization, zoning, adequacy, financing, revenues and expenses, evaluation, and safety; the airport and its socioeconomic effect on the community. *Prereq. none.*

96.377 General Aviation Operations B (3 cl., 3 q.h.)

Study and analysis of airport functions, such as, fixed base operators, pilot training schools; airtaxi operations in both charter and schedule activities. *Prereq. 96.376.*

96.378 Air Traffic Control Systems A (3 cl., 3 q.h.)

Survey of the total aerospace system and management; air traffic administrative coordination; regional responsibilities; NAFEC organization of center, tower, and station. *Prereq. none.*

96.383 Advanced Aircraft Analysis (2 cl., 2 q.h.)

A presentation of supersonic aerodynamics and structural characteristics of aircraft. *Prereq. 11.318.*

96.384 Aviation History (3 cl., 3 q.h.)

Historical survey of efforts in manned flight, aircraft development, pioneers in flight, general aviation, military and commercial aspects of flight, and effects on modern civilization. *Prereq. none.*

96.391 Air Science & Navigation A (3 cl., 3 q.h.)

Aircraft structures and components; aerodynamic forces; airfoil terminology—lift and drag coefficient; boundary layer problems and control; Reynolds Number and Scale Effect; earth in space; latitude; longitude; properties and components of the atmosphere; map projections; dead reckoning; reciprocating engine theory; gas turbine engine theory; planform effects; aircraft weight and balance.

96.392 Air Science & Navigation B (3 cl., 3 q.h.)

Radio navigation; VOR, ADF, DME, and TACAN; federal air regulations; airplane performance (climb, range, altitude, takeoff, and landing); aircraft propeller theory and operation; specific aircraft substructures (landing gear et. al.); advanced DR navigation problems (radius of action, unknown wind); general review. *Prereq.* 96.391.

96.393 Advanced Air Science & Navigation A (3 cl., 3 q.h.)

Supersonic aerodynamics physiologic factors of flight; instrument flight charts; IFR planning; instrument flight rules; static and dynamic axial stability of aircraft; control movements and forces; stability problems. *Prereq.* 96.392.

96.394 Advanced Air Science and Navigation B (3 cl., 3 q.h.)

Spins and spin recoveries; flying high performance aircraft; area charts; arrival and departure; SID charts; clearance notation; aircraft performance; applications of aerodynamics to specific problems of flight; helicopter stability; structural strength limitations; doppler radar; precision approach radar and airport surveillance radar; loran; consolan; pressure pattern flight. *Prereq.* 96.393.

96.395 Meteorology & Climatology A (3 cl., 3 q.h.)

A survey of the principles of meteorology and structure of the atmosphere; meteorological instruments and observations; weather map interpretation and common aviation weather teletype codes. *Prereq.* 11.317.

96.396 Meteorology & Climatology B (3 cl., 3 q.h.)

Physical approach to pressure, temperature, basic thermodynamics, stability, and cloud formations; climate causes and effects; climatology of several regions of the world; application of climatology to problems of airport location and construction, airline operation, and private flying. *Prereq.* 96.395.

96.399 Flight Physiology (2 cl., 2 q.h.)

The study of the physical and chemical processes of the body; functions of the living body and its environment; adaptive changes of function of the body resulting from a change in environment with emphasis on flight; the effects of medication on the function and reactions of the body with emphasis on flight; the effects of the state of the mind on the function and reactions of the body with emphasis on flight.

96.401 Aircraft Engines I (2 cl., 2 q.h.)

Engine types, nomenclature, and engine development; engine cycles and principles, performance, power and its measurement, ratings; design and construction of parts and their functions; valve mechanisms and timing; cooling system, carburetion, fuel system, ignition system, lubrication, and oil system design. *Prereq.* none.

96.402 Aircraft Engines II (2 cl., 2 q.h.)

A presentation of turbo-engine types and their development; radial flow and axial flow types, turbo-prop, compounding, ram jets, pulse jets and rockets; principles of combustion and propulsion, performance, power, thrust, and their measurement, design, and construction; fuel, lubrication, and ignition systems. *Prereq.* 96.401.

96.404 Fundamentals of Aeronautics (4 cl., 4 q.h.)

Aircraft structures and components; aerodynamic forces; airfoil terminology—lift and drag coefficient; boundary layer problems and control; Reynolds Number and Scale Effect; earth in space; latitude; longitude; properties and components of the atmosphere; map projections; dead reckoning; reciprocating engine theory; gas turbine engine theory; planform effects; aircraft weight and balance. Federal Aviation Regulations for Private Pilot. *Prereq.* none.

96.425 Chronology of Aviation I (2 cl., 2 q.h.)

1903-1939; early flights 1903-1914 era; World War I 1914-1918 era; airmail and barnstorming era; famous pilots and company histories traced 1920-1939 era, including history of air racing. *Prereq.* none.

96.426 Chronology of Aviation II (2 cl., 2 q.h.)

1939-present; World War II 1939-1945 era; all personalities and company histories traced; post World War II up to Apollo 17, final flight in Apollo program. *Prereq.* none.

96.430 Aviation Preventive Maintenance (2 cl., 2 q.h.)

For pilots and aircraft owners. Airframe and powerplant nomenclature, structures, and systems; maintenance that a pilot can and is allowed to do to the airframe and engine of his aircraft; proper techniques. *Prereq.* none.

96.431 Aircraft Systems (2 cl., 2 q.h.)

Hydraulic, pneumatic, electrical, and mechanical systems; landing gear types, design, loads, and limitations; landing gear retraction systems; general flight control systems including rudder, elevator, aileron, and flaps; loads and limitations; de-icer systems for flight surfaces, propeller, and engine breathing systems; cabin pressure and oxygen systems; airspeed and general air-driven instrument systems. *Prereq.* none.

96.432 Aircraft Laboratory (2 lab., 1 q.h.)

Aircraft construction methods and techniques will be applied to the construction of aircraft components. *Prereq.* none.

96.500 Tactical Air Field Refueling System (cl. special, 4 q.h.)

Classroom and practical training will be utilized to assure student capability to both operate and maintain the tactical Air Field Refueling System. Practical applications to make the student aware of 1) set up; 2) terrain features; 3) operation of pumps and bladders for possible problems and actions to be taken; 4) fuel testing for contamination; will be conducted utilizing the actual physical equipment. *Prereq.* none.

GENERAL INTEREST COURSES

In response to repeated requests, we are offering several new courses in technology which do not require students to have a mathematical background. These courses have a three-fold purpose: 1) we would like to encourage liberal arts and business students to become interested in technology; 2) we hope that new students without mathematical backgrounds will be sufficiently attracted to science and technology that they will ultimately undertake our regular curricula; 3) these courses should serve to clarify the complexities of our technological world for anyone who chooses to undertake them.

01.401 Technology of Modern Architecture I (2 cl., 2 q.h.)

The general background of architectural styles, both historical and contemporary, with emphasis on the engineering design aspects and construction procedures concerned with the various types of buildings involved. *Prereq. none.*

01.402 Technology of Modern Architecture II (2 cl., 2 q.h.)

Contemporary architecture, with an emphasis on the engineering design aspects and construction procedures required for modern buildings. *Prereq. none.*

02.401 Man and Materials (2 cl., 2 q.h.)

The consumption of earth's raw materials has increased drastically, creating serious ecological problems. Metals, plastics, ceramics, concrete, etc. evolve from substances in the earth's crust; unfortunately however, they are not properly recycled because costs have always come before environment. This course will explore what action man may take now to prevent chaos in the future. *Prereq. none.*

03.401 Electric Devices and Systems I (2 cl., 2 q.h.)

A non-mathematical examination of electric and electronic devices which have become a part of daily living; analysis of functional demands and their realization in elementary working systems; ratings and applications of devices, including light, heat, and mechanical energy convertors. *Prereq. none.*

03.402 Electric Devices and Systems II (2 cl., 4 q.h.)

A continuation of 03.401; discussion of modern communications systems, radio, TV, telephone; economic trade-off in designs; energy sources and energy conversion, transmission systems; rate basis implications of increased load base; atomic vs. fossil fuels. *Prereq. 03.401.*

09.401 Interpretation of Industrial Drawings (2 cl., 2 q.h.)

Emphasis on the understanding of the concepts conveyed by working engineering drawings; practice is provided in reading and interpreting the standard conventions and symbols used to transmit the designer's ideas to the tradesman or craftsman. No formal drafting will be done, although a few freehand sketches will be encouraged. *Prereq. none.*

10.401 Foundations of Mathematics I (2 cl., 2 q.h.)

The many branches of mathematics; origins of arithmetic and algebra and their place in early societies. *Prereq. none.*

10.402 Foundations of Mathematics II (2 cl., 2 q.h.)

Mathematics and the scientific revolution; functions, graphs, concepts of the calculus. *Prereq.* 10.401.

10.403 Foundations of Mathematics III (2 cl., 2 q.h.)

Mathematics today: analysis, probability, statistics, and other topics; the mutual dependence of mathematics and computers; math in social sciences, physical sciences, and business. *Prereq.* 10.402.

11.401 Man's Physical Environment I (2 cl., 2 q.h.)

The nature of energy; its courses and the economics of its expenditure; the harmonious interactions of natural physical systems and the conservations which govern them; man's exploitations of these laws; the cyclic nature of useful physical processes; reversible and irreversible. *Prereq.* none.

11.402 Man's Physical Environment II (2 cl., 2 q.h.)

The methods by which man gains knowledge of two inscrutable areas of his environment; effects of scale from astro-physical to atom; the paradoxical implications of this knowledge and its effect on man's dealings with his environment. *Prereq.* none.

LINCOLN COLLEGE ENGINEERING TECHNOLOGY DAY BET COURSES LISTED WITH EQUIVALENT EVENING COURSES

Day BET Courses		Q.H.	Equivalent Evening Courses		Q.H.
10.407	College Algebra & Trig. I	4.0	10.307	College Algebra & Trig. I	4.0
10.408	College Algebra & Trig. II	4.0	10.308	College Algebra & Trig. II	4.0
10.420	Calculus I	4.0	10.320	Calculus I	4.0
10.421	Calculus A	4.0	10.321, 10.322	Calculus II, III	4.0
10.422	Calculus B	4.0	10.323, 10.324	Calculus IV; Diff. Equa. I	4.0
11.417	Physics I	4.0	11.317	Physics I	4.0
11.418	Physics II	4.0	11.318	Physics II	4.0
11.419	Physics III	4.0	11.319	Physics III	4.0
11.473	Physics Laboratory	2.0	11.373	Physics Laboratory	2.0
11.474	Physics Laboratory	2.0	11.374	Physics Laboratory	2.0
09.421	Princ. of Comp. Prog. I	2.0	09.351	Princ. Comp. Prog. I	2.0
09.422	Princ. of Comp. Prog. II	2.0	09.352	Princ. Comp. Prog. II	2.0
09.423	Princ. of Comp. Prog. III	2.0	09.353	Princ. Comp. Prog. III	2.0
09.461	Eng. Design Graphics I	2.0	09.311	Engin. Graphics I	2.0
09.462	Eng. Design Graphics II	2.0	09.312	Engin. Graphics II	2.0
09.463	Eng. Design Graphics III	2.0	09.313	Engin. Graphics III	2.0
09.464	Eng. Design Graphics IV	4.0	09.314	Engin. Design I, 02.506 Mechanical Design I	4.0
09.461	Eng. Design Graphics I	2.0	09.307	Electric. & Electronics Graphics I	2.0
09.422	Eng. Design Graphics II	2.0	09.308	Electric. & Electronics Graphics II	2.0

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09.423	Eng. Design Graphics III	2.0	09.309	Electric. & Electronics Graphics III	2.0
03.420	Electricity & Electronics I	4.0	03.320,	03.321 Electricity & Elec. I, II	4.0
03.421	Electricity & Electronics II	4.0	03.322	Electricity & Electronics III (Plus 2 q.h.)	4.0
30.113	Freshman Writing	4.0	30.305	English I (Plus 1 q.h.)	4.0
30.114	Intro. to Lit.	4.0	30.306	English II (Plus 1 q.h.)	4.0
30.115	Great Themes in Lit.	4.0	93.404	Tech. Commun. (Plus 1 q.h.)	4.0
39.115	Principles of Economics	4.0	39.301	Econ. Principles & Prob. (Plus 1 q.h.)	4.0
	5 Liberal Arts Electives	20.0		7 Liberal Arts Electives	21.0
02.411	Mechanics A	4.0	02.501	Statics; 02.502 Struc. Mech.	4.0
02.412	Mechanics B	4.0	02.504	Particles Dynamics (Plus 2 q.h.)	4.0
02.413	Mechanics C	4.0	02.505	Kinematics of Bodies: 02.506 Body Dynamics	4.0
02.414	Stress Analysis A	4.0	02.503,	02.507 Strength of Materials I, II	4.0
02.415	Stress Analysis B	4.0	02.508	Stress Analysis, 02.509 Deflection Analysis	4.0
02.416	Stress Analysis C	4.0	02.510	Adv. Stress Anal. (Plus 2 q.h.)	4.0
02.417	Mechanical Design A	4.0	02.527,	02.528 Mech. Design II, III	4.0
02.418	Mechanical Design B	2.0	02.529	Mechanical Design IV	4.0
02.421	Thermodynamics A	4.0	02.531,	02.532 Thermodynamics I, II	4.0
02.422	Thermodynamics B	4.0	02.353	Thermodynamics III, 02.557 Heat Eng. & Turbines	4.0
02.423	Thermodynamics C	4.0	02.558	Refrigeration; 02.559 Air Conditioning	4.0
02.424	Thermodynamics D	4.0	02.554	Heat Transfer (Plus 2 q.h.)	4.0
02.425	Thermodynamics E	4.0	02.555	Heat Transfer II; 02.566 Heat Exchanger Design	4.0
02.431	Materials A	4.0	02.541	Mechanical Behavior; 02.542 Physical Behavior of Mats.	4.0
02.432	Materials B	4.0	02.543	Materials & Processes; 02.344 Applied Metallurgy	4.0
02.433	Applied Metallurgy	4.0	02.345,	02.346 Applied Metallurgy II, III	4.0
02.441	Fluid Mechanics A	4.0	01.341,	01.342 Fluid Mechanics I, II	4.0
02.442	Fluid Mechanics B	2.0	01.343	Fluid Mechanics III	2.0
02.451	Mechanical Vibrations	4.0	02.337,	02.338 Mechanical Vibrations I, II	4.0

02.452	Experimental Stress Analysis	4.0	02.511,	02.512 Exper. Stress Analysis, I, II	4.0
02.461	Machine Shop	4.0		Not Available in the Evening Program	
02.462	Mechanical Tech. Lab. I	2.0	02.531	Measurement & Anal. Lab.	2.0
02.468	Mechanical Tech. Lab. II	2.0	02.532	Mechanical Tech Lab. I	2.0
02.464	Mechanical Tech. Lab. III	2.0	02.533	Mechanical Tech. Lab. II	2.0
02.469	Heat Tech. Lab. I	2.0	02.535	Thermo. Tech. Lab. I	2.0
02.466	Heat Tech. Lab. II	2.0	02.536	Thermo. Tech. Lab. II	2.0
02.467	Project Lab.	4.0		Not Available in the Evening Program	
04.481	Nuclear Technology	4.0	04.381,	04.382 Nuclear Tech. I, II	4.0
03.490	Optical Instrumentation	4.0	03.396	Basic Optics for Instrumentation; 03.397 Optical Instrumentation	4.0
03.410	Electrical Measurements	4.0	03.306	Electrical Measurements (Plus 2 q.h.)	4.0
03.411	Electronics I	4.0	03.311	Electronics I	4.0
03.412	Electronics II	4.0	03.312	Electronics II	4.0
03.413	Electronics III	4.0	03.313	Electronics III	4.0
03.423	Electronics Lab.	2.0	03.323	Electronics Lab.	2.0
03.424	Circuits Lab. I	2.0	03.324	Circuits Lab. I	2.0
03.425	Circuits Lab. II	2.0	03.325	Circuits Lab. II	2.0
03.427	Adv. Elec. Lab. I	2.0	03.327	Adv. Elec. Lab. I	2.0
03.428	Adv. Elec. Lab. II	2.0	03.328	Adv. Elec. Lab. II	2.0
03.429	Adv. Elec. Lab. III	2.0	03.329	Adv. Elec. Lab. III	2.0
03.430	Energy Conversion	4.0	03.331,	03.332 Energy Conversion I, II	4.0
03.437	Distributed Systems	4.0	11.321	Wave Phenomena (Plus 2 q.h.)	4.0
03.440	Physical Electronics	4.0	11.320	Semiconductor Phys. & Dev. or	4.0
			11.322,	11.323 Semicon. Phys., Semicon. Dev.	4.0
03.451	Circuit Analysis I	4.0	03.301,	03.302 Circuit Theory I, II	4.0
03.452	Circuit Analysis II	4.0	03.303,	03.304 Circuit Theory III, IV	4.0
03.453	Circuit Analysis III	4.0	03.361,	03.362 Transients in Linear Sys. I, II	4.0
03.454	Circuit Analysis IV	4.0	03.363	Transients in Linear Sys. III (Plus 2 q.h.)	4.0
03.460	Engineering Analysis	4.0	10.325,	10.326 Differential Equations II, III	4.0
03.470	Digital Computers	4.0	03.371,	03.372 Analog & Digital Computer Technology	4.0
03.477	Control Engineering I	4.0	03.377,	03.378 Control Systems I, II	4.0
03.478	Control Engineering II	4.0	03.379	Control Systems III (Plus 2 q.h.)	4.0

the lincoln college faculty

THE STRENGTH of an educational institution lies in the quality of its faculty. This is especially true in a college devoted to the training of mature men and women, many of whom are already employed in their chosen professions.

The instructional staff of Lincoln College is composed of professional academicians from Northeastern University and neighboring educational institutions and practicing professionals from the scientific and industrial community of Greater Boston. The theoretical training and practical experience represented by this combination of specialists is ideally suited to the technology programs they teach and the adult students they serve.

The faculty are selected for their ability and active interest in the welfare of ambitious part-time students. They are men and women of culture and high ideals and are qualified by educational training and professional experience to teach effectively in their respective fields.

A staff of experienced professional educators who serve as program and course consultants constitutes the Academic Advisory Council and Curriculum Advisory Committee of the College. They guide, supervise, and assist with the administration of courses and programs.

THE FACULTY

The following is an alphabetical list of the faculty of Lincoln College; degrees earned; professional affiliation; titles and Lincoln College department (year of appointment).

Arnold M. Aaron, B.S., M.S.
Engineer Naval Underwater Systems Center
Electrical Engineering Technology (1974)

Arnold W. Almquist, Jr., B.S., M.Ed.
Chairman, Math. dept., Needham High School.
Mathematics (1967)

José Alvarez, B.S., M.S.,
Engineer General Electric Co.
Mechanical Engineering (1977)

- Bruce C. Anderson, A.S., B.S., M.S.
Technical Staff of GTE Laboratories
Electrical Engineering Technology (1976)
- Peter Anderson, B.S., M.S.,
Electrical Engineer, Stein Associates, Inc.
Electrical Engineering (1976)
- Will C. Anderson, B.S., M.S.
Principal Programmer, Digital Equipment Corp.
Engineering Graphics and Computation (1968)
- *Robert B. Angus, Jr., B.S., M.S., P.E. (Mass.)
Principal and Consultant; Angus Associates
Electrical Engineering Technology (1947)
- Victor S. Aramati, M.S., B.S.
Bell Telephone Laboratories
Mechanical Engineering Technology (1970)
- Dale F. Aroy, M.S.E.E.
Computer Systems Eng., Mitre Corp.
Electrical Engineering Technology (1975)
- Louis E. Ashley, A.B. M.Ed.
Senior Staff Consultant, Product Technology,
Arthur D. Little, Inc.
Mechanical Engineering Technology (1966)
- *Robert J. Averill, B.S., M.S.
Chief Engineer, Sala Magnetics, Inc.
Course Consultant for Electrical Engineering Technology (1957)
- Kenneth Ayube
Resource Inst., Boston Latin Academy
Physics (1976)
- *Russell H. Babcock, S.B., S.M., P.E. (Mass., Maine, N.H., R.I., Vt., Conn., N.Y.)
Diplomate, American Academy of Environmental Engineers;
Consulting Eng. Private Practice
Civil Engineering Technology (1954)
- John C. Balsavich
Laboratory Supervisor, Electrical Engineering, Northeastern University.
Electrical Engineering Technology (1957)
- Adolph Baumann, B.S., P.E. (Mass.)
Telecommunications Eng., GTE Sylvania
Electrical Engineering Technology (1955)
- Matteo P. Berardi, B.S., M.S.
Engineering Supervisor Stone & Webster Corp.
Mechanical Engineering Technology (1960)
- Maureen P. Berggren, B.S.
Mathematics (1965)
- Ralph S. Blanchard, B.S.M.E., M.S.M.E.
Assistant Dean, College of Engineering, Northeastern University.
Assoc. Program Consultant, Mechanical Engineering Technology (1950)
- Emmanuel E. Bliamptis, B.S., S.M., M.A., P.E. (Mass.)
Research Physicist, Air Force Cambridge Research Labs.
Physics (1965)
- Robert E. Bobeck
Professor Bristol Community College
Engineering Graphics and Computation (1976)

*Appointed to the rank of Senior Lecturer

- *Edward Bobroff, B.M.E., P.E. (Mass.)
Consultant, Sala Magnetics
Program Consultant for Mathematics (1946)
- Alan Bradshaw, B.S., M.S.
Principal, Chelmsford School System.
Mathematics (1966)
- *Eugene G. Branca, S.B., S.M.
Assistant Headmaster (Retired), Hyde Park High School.
Course Consultant Mathematics (1946)
- Thomas F. Brennan, B.S., M.S.
Engineer, Boston Edison Co.
Electrical Engineering Technology (1971)
- Donald H. Breslow, S.B., M.S.,
Director of Engineering, Measurement Systems Division, Itek Corp.
Electrical Engineering Technology (1959)
- Alfred E. Bresnahan, B.S., M.A.
Vice-Principal, Lynn English High School.
Mathematics (1967)
- Donald C. Brock, B.S., M.S.
Mathematics Instructor, Needham High School.
Mathematics (1965)
- *Franklyn K. Brown, B.S.Ed., M.Ed.
Associate Professor, Graphic Science, Northeastern University.
Course Consultant for Engineering Graphics and Computation (1955)
- William A. Brown, B.S.E.E., M.S.E.E., J.D.
Assistant Professor of Law, Suffolk University Law School.
Electrical Engineering Technology (1965)
- Jeffrey L. Bruce, B.S., M.A.
Instructor, Dover-Sherborn Regional High School.
Mathematics (1969)
- *Morris H. Burakoff, B.S., P.E. (Mass.)
Department Chief, Western Electric Company.
Electrical Engineering Technology (1957)
- Ralph A. Buonopane, B.S., M.S., Ph.D.
Associate Professor of Chemical Engineering, Northeastern University.
Course Consultant for Nuclear Technology (1964)
- Gregory J. Cahill
Engineer, Jackson Moreland.
Mechanical Engineering Technology (1968)
- *Leroy M. Cahoon, B.S.C.E., M.S., P.E. (Mass., Connecticut)
Associate Professor of Civil Engineering, Northeastern University.
Program Consultant for Civil Engineering Technology (1962)
- John J. Callahan, B.S., M.Ed., M.A.
Assistant Professor, Boston State College.
Mathematics (1969)
- *Frank R. Cangiano, B.S., Ed.M.
Instructor in Science and Mathematics, Medford High School.
Mathematics (1957)
- Barry S. Canner, Associate in Science
Wiggins Airways
Aviation Technology (1970)
- Edgar T. Canty, B.S., M.S.
Director Academic Computing Services,
Mathematics (1966) Babson College
- *Appointed to the rank of Senior Lecturer

- Joseph M. Cardito, B.S., M.S., Phd.
Radiation Protection Analyst, Stone and Webster Eng. Corp.
Mechanical Engineering Technology (1978)
- William B. Carter, A.B., S.M.
Information System Specialist, Polaroid Corporation.
Engineering Graphics and Computation (1974)
- Robert W. Case, Ph.D.
Mathematics (1976)
- *Walter J. Casey, A.B., M.Ed., M.A.T.
Head of Math. Department, Brighton High School.
Mathematics (1955)
- Margret P. Casper, A.B., M.Ed.
Teacher Wrentham Public Schools
Mathematics (1977)
- Philip J. Ciang, B.S., P.E. (Conn., Mass., Pa.)
Project Manager, United Engineers & Constructors, Inc.
Mechanical Engineering Technology (1957)
- Thomas C. Coleman, B.S.M.E., M.S.M.E.
Engineer, United Engineering and Construction.
Course Consultant Mechanical Engineering Technology (1960)
- Michael F. Collins, B.S., M.S.
Mechanical Engineering Technology (1977)
- Wendell R. Collymore
Drafting Supervisor, Polaroid Corp.
Engineering Graphics and Computation (1976)
- Leonard M. Conlin, A.B., Ed.M.
Mathematics Teacher, Framingham North High School, Boston College MAT Program.
Mathematics (1967)
- Joseph V. Connolly, B.S., M.Ed.
Head of Science Department, Boston Latin School.
Physics (1965)
- *Roger T. Connor, A.B., M.Ed.
Principal, Milton High School.
Mathematics (1953)
- *Robert J. Connors, B.S.
Manager of Technology, Electronic Systems, Sylvania Electric Products, Inc.
Electrical Engineering Technology (1948)
- Joseph Z. Cooper, B.S.E.
Principal Engineer, Raytheon Company.
Engineering Graphics and Computation (1967)
- James B. Corscadden, B.S., M.Ed., A.M.T.
Assistant Headmaster, South Boston High School.
Mathematics (1967)
- David C. Crockett, B.S., M.S.
Engineer GTE Sylvania
Graphics Instructor, Fitchburg State College.
Mechanical Engineering Technology (1969)
- Steven S. Cushman, B.S.
Exec. Asst. Registrar of Motor Vehicles Mass.
Engineering Graphics and Computation (1977)
- Mukti Lal Das, B.S., M.S., Ph.D., P.E. (Mass.)
Senior Structural Engineer, Boston Edison Co.
Civil Engineering Technology (1972)

*Appointed to the rank of Senior Lecturer

- *Herbert R. Davenport, B.S.
Standards Engineer, General Radio Company.
Electrical Engineering Technology (1948)
- James J. Davlin, B.S., M.S.
Instructor, Wentworth Institute.
Physics (1976)
- *Warren C. Dean, A.B., M.A.
Professor of Mathematics, Northeastern University.
Course Consultant for Mathematics (1941)
- John L. Dearness, A.S.E.E., B.S.E.E.
Unit Manager, Northrop Corporation
Aviation Technology (1972)
- Charles A. DeAngelis, B.S., M.S.
Senior Structural Engineer, Stone and Webster Eng. Corp.
Civil Engineering Technology (1976)
- Thomas R. Deveney, B.S.
ESAA Mathematics Coordinator, Boston Public Schools
Mathematics (1965)
- Donald R. DeVitt, B.S., M.S.
Systems Manager Perception Tech. Corp.
Engineering Graphics and Computation (1977)
- Douglas H. Diamond
Program Manager, Analytical Systems Eng. Corp.
Mathematics (1968)
- Giles C. Dilg, B.S.E.E., M.S.E.E., P.E. (Mass.)
Program Manager, Incoterm.
Engineering Graphics & Computation (1966)
- Marie Dolansky, B.S., Ed.M., Ed.D., C.G.A.
Inst. Psychology, Middlesex Community Col.
Mathematics (1964)
- Mark Domaszewicz, B.E.E., M.S.E.E.
Senior Engineer, Raytheon Company.
Electrical Engineering Technology (1970)
- Leonard F. Dow, B.S.E.E., M.S., P.E. (Mass.)
Boston Edison Company, Staff Engineer.
Electrical Engineering Technology (1970)
- Paul C. Dow, Jr., B.S., M.S.E., Ph.D.
Engineering & Mngmt. Avco Corp.
Course Consultant, Electrical Engineering Technology (1973)
- Philip W. Dunphy, B.Sc., M.Ed.
Associate Professor of Cooperative Education, Northeastern University.
Academic Counsellor (1967)
- William V. Durante, B.S., M.Ed., M.A.
Head of Mathematics Dept., Boston Latin School.
Mathematics (1964)
- John A. Ebacher, B.S., M.S.
Engineer, General Electric Co.
Mechanical Engineering Technology (1967)
- Henry B. Eden, B.S.
Vice President, Anco Technical Services Inc.
Engineering Graphics and Computation (1957)
- Adolf J. Erikson, B.B.A., M.B.A., P.E. (Mass.)
President, A.E. Engineering Corporation.
Engineering Graphics and Computation (1966)

*Appointed to the rank of Senior Lecturer

- Warren J. Falzone
Research Engineer, GTE Sylvania.
Engineering Graphics and Computation (1975)
- *Martin J. Feeney, S.B., Ed.M.
Principal Emeritus, Boston Public Schools.
Mathematics (1957)
- Warren G. Ferzoco, A.E., B.B.A., M.Ed., C.A.G.S.
Dean, Cambridge High and Latin School.
Engineering Graphics and Computation (1966)
- Charles Field, B.S., M.Ed.
Professor of Cooperative Education, Northeastern University.
Academic Counsellor (1967)
- *William D. Finan, A.B., M.A., D.Ed.
Reading Director, Needham Public Schools.
Course Consultant for Mathematics (1946)
- *Louis A. Fiore, A.E., B.B.A.
Mech. Engineer, Design Checker, American Science and Engineering, Inc.
Engineering Graphics and Computation (1956)
- Earlwood T. Fortini, A.B., P.E. (Mass.)
Manager Graphic Products Development, Compugraphic Corp.
Mechanical Engineering Technology (1957)
- Robert M. Fox, A.S., B.S., M.B.A.
Marketing Manager, Gerber Electronics Inc.
Mathematics (1969)
- Maurice Freedman, B.S.
Principal Eng. Sasaki Associates Inc.
Civil Engineering Technology (1977)
- *Peter D. Gianino, B.S., M.S.
Research Physicist, Air Force Deputy for Electronics Technology
Mathematics (1965)
- Sheldon L. Glickler, B.S., M.S.
Avco Everett Research Laboratory, Senior Scientist.
Civil Engineering Technology (1969)
- *William B. Goggins, Jr., B.S. M.S.E.E., Ph.D.
Chief, Advanced Radar Techniques Group,
Air Force Cambridge Research Laboratories.
Control Systems Engineering (1964)
- David Goldberg, B.S., M.S.E.E., M.S.E.M.
Research & Development Engineer, GTE Sylvania.
Course Consultant Engineering Graphics and Computation (1969)
- Bernard F. Goldstein, B.S., M.S., Ph.D.
Senior Analyst, Dynamics Research Corporation.
Electrical Engineering Technology (1974)
- Leonard M. Goodman, S.B., S.M., E.E., P.E. (Mass.)
Staff Member, Lincoln Laboratory, Mass. Institute of Technology.
Electrical Engineering Technology (1969)
- Norman A. Gray, B.S.
Mechanical Engineering Technology (1978)
- Forest W. Grumney, B.A., M.B.A.
N.E.G.E.A. Service Corp.
Mathematics (1963)
- *Francis R. Hankard, S.B., M.A.
Senior Chemist, State Police Laboratories.
Course Consultant for Physics (1946)
- *Appointed to the rank of Senior Lecturer

- Jeffrey H. Hanson, B.S.
Sr. Engineer United Eng'g. Contractors
Mechanical Engineering Technology (1977)
- *Joseph J. Hansen, A.B., M.B.A.
Director, Planning Analysis, Raytheon Co.
Assoc. Program Consultant for Mathematics (1959)
- *George C. Harrison, B.S., M.S.
Senior Principal Electronic Engineer, Polaroid Corp.
Electrical Engineering Technology (1962)
- Harold Harutunian, A.B., M.A.T., Ed.D.
Asst. Prof., Salem State College.
Mathematics (1965)
- Harry E. Hewes, B.S.B.A., M.Ed.
Teacher, Boston Latin School.
Mathematics (1967)
- Lewis H. Holzman, B.S.C.E., S.M.C.E., P.E. (Mass.)
Supervisor, Applications Programming, Stone and Webster Engineering Corp.
Engineering Graphics and Computation (1966)
- C. Gregory Hood, B.S., M.A., Ph.D.
Science & Math Teacher, Newton Public Schools
Course Consultant Physics (1975)
- Michael A. Iorine, B.S., M.S.
Instructor Chemical Eng. Northeastern University
Mechanical Engineering Technology (1977)
- Charles E. Jacob, B.S.E.E., M.S.Ed., M.L.S.
Master, Boston Latin School.
Physics (1967)
- *Perry G. Jameson, B.S., M.Ed.
Hyde Park High School, Asst. Headmaster, Mathematics.
Mathematics (1965)
- Arthur W. John, B.S.E.E., M.S., M.B.A.
Engineer, Data General
Physics (1968)
- Michael R. John, B.A., M.S.
Assist. Prof., Wentworth Institute
Mathematics (1975)
- Eugene F. Joyce
Technician, Electrical Engineering Dept., Northeastern University, U.S. Army Retired.
Electrical Engineering Technology (1963)
- John Kaczorowski, Jr., B.S.E.E., M.S.E.E.
Instructor, Electrical Engineering, Northeastern University.
Assoc. Program Consultant, Electrical Engineering Technology (1970)
- *Leon Katler, Certificate P.E. (Mass., Maine, N.Y., Pa.)
Senior Structural Engineer, Stone & Webster Engineering Corporation.
Civil Engineering Technology (1963)
- *Louis Katona, B.C.E., M.C.E., P.E. (Mass., N.Y.)
Senior Hydraulic Engineer, Badger America, Inc.
Civil Engineering Technology (1959)
- *Charles W. Kaufman, B.S.Ed., Ed.M., M.N.S.
Guidance Counselor, Boston Latin Academy
Physics (1958)
- Sidney W. Kaye, B.Sc., M.Ed.
Senior Engineer, Raytheon Co.
Mathematics (1967)

*Appointed to the rank of Senior Lecturer

- *George F. Kent, B.S., M.S., P.E. (Mass.)
Senior Power Engineer, Stone & Webster Engineering Corp.
Course Consultant for Materials (1962)
- Bernard J. Kiley, B.E., M.E., P.E. (N.H., Mass.)
Senior Structural Engineer, Stone and Webster Corporation.
Mechanical Engineering Technology (1958)
- Mark M. Kiley, B.E., M.E., P.E. (Mass., R.I., La., Me., Vt., N.H.)
Manager, Day and Zimmerman Associates.
Mechanical Engineering Technology (1955)
- Philip D. Kingman, B.S.C.E., LL.B., P.E. (Mass., N.H.), R.L.S. (Mass., Me., N.H.)
Asst. Vice President and Counsel Chicago Title Insurance Co.
Civil Engineering Technology (1964)
- *John J. Klein, B.S., M.S.
Manager, Design Engineering
Radio Corporation of America.
Electrical Engineering Technology (1950)
- Joseph C. LaCroix
Chairman of Math. Dept., Dorchester High School.
Mathematics (1974)
- *Horatio W. Lamson, B.S., M.A., P.E. (Mass.)
Research Engineer, Emeritus, General Radio Company.
Course Consultant Electrical Engineering Technology (1945)
- *Robert S. Lang, B.S., Ed.M.
Associate Professor, Graphic Science, Northeastern University.
Program Consultant for Engineering Graphics and Computation (1955)
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Instructor Mass Bay Community College.
Mathematics (1974)
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Quincy Public Schools.
Mathematics (1965)
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Applied Mathematician, The Analytical Science Corp.
Mathematics (1968)
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Instructor, Braintree High School
Engineering Graphics and Computation
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Dept. Manager, Raytheon Co., Burlington, Mass.
Physics (1967)
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Instructor, Lynn English High School.
Mathematics (1967)
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President, Applied Measurements, Inc.
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Senior Engineer, United Engineers and Constructors.
Civil Engineering (1972)
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Principal Engineer, Charles Stark Draper Laboratory, Inc.
Physics (1966)
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Architect Private Practice
Civil Engineering Technology (1975)

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Design Engineer, Charles Stark Draper Laboratory, Inc. (Retired)
Mechanical Engineering Technology (1946)
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Associate Prof. Mechanical Eng. Northeastern University
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Senior Staff, Arthur D. Little, Inc.
Course Consultant Electrical Engineering Technology (1952)
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Director, EMAPELS School of Survey.
Civil Engineering Technology (1950)
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Chief Engineer, General Engineering, United Eng. & Constr. Inc.
Mechanical Engineering Technology (1960)
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Air Force Electronic Systems Division
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Staff Member, Massachusetts Institute of Technology.
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Engineering Consultant, Private Practice
Electrical Engineering Technology (1951)
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Project Engineer, Howard, Needles, Tammen & Bergendorff.
Civil Engineering Technology (1960)
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Computer Specialist, Department of Transportation.
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Technical Writing Consultant, Megapulse, Inc.
Mechanical Engineering Technology (1978)
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Headmaster Emeritus, Dorchester High School.
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Teacher, Weeks Junior High School.
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Civil Engineering Technology (1970)
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Acting Dept. Head, South Boston High School.
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Applications Engineer National Semiconductors
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Mechanical Engineer, Army Materials and Mechanics Research Center.
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Instructor, Newton North High School.
Electrical Engineering Technology (1952)
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Engineer, Northrop Corporation.
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Mathematics (1967)
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Project Manager, Raytheon Corp.
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Engineer, Stone and Webster Co.
Mechanical Engineering Technology (1966)
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Research Associate, Northeastern University.
Electrical Engineering Technology (1966)
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Electrical Engineering Technology (1970)

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Principal Engineer, Digital Equipment Corporation.
Course Consultant, Electrical Engineering Technology (1960)

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Ratcliffe Marine Design.
Electrical Engineering Technology (1955)

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Chief Design Engineer and Associate of Kennedy, Kennedy, Keefe, and Carney.
Civil Engineering Technology (1972)

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Mathematics (1967)

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Physics (1967)

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Mathematics (1958)

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Physics (1958)

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Mathematics (1966)
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Mechanical Engineering Technology (1970)
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Mathematics (1959)
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Mechanical Engineering Technology (1955)
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Assistant to the Dean, Department of Cooperative Education, Northeastern University.
Academic Counsellor (1967)
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Engineering Graphics and Computation (1966)
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R.L.S. (Mass., Conn., N.H., Me., R.I., Vt.)
Senior Structural Engineer, Stone & Webster Engineering Corporation.
Civil Engineering Technology (1965)
- James Steinberg, B.S.
Computer Specialist, Dept. Trans., Trans. Systems Center
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Teacher, Braintree High School.
Physics (1967)
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Senior Research Associate in Electrical Engineering, Northeastern University.
Course Consultant Electrical Engineering Technology (1962)
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Research Associate in Mechanical Engineering, Northeastern University.
Mechanical Engineering Technology (1969)
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Mathematics (1977)
- Laurence R. Swain, Jr., B.S., M.S.
Manager, Product Development, Adage, Inc.
Physics (1961)
- Dexter E. Swift, B.S., M.Ed.
Teacher, City of Lynn.
Physics (1968)
- *Jason R. Taylor, B.S., M.S.
Editor of Wang Laboratories PROGRAMMER Magazine &
Executive Director of SWAP Users Society.
Mathematics (1966)

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Mathematics (1956)
- Richard W. Torian, B.S., M.E.
Chairman of Math. Dept. Ashland High School
Mathematics (1965)
- Melvin W. Tracey, B.S., S.M.
Sales Manager, Lytron Inc.
Mechanical Engineering Technology (1968)
- *John S. Travia, B.S.E.E., M.S.E.E., M.S.E.M., P.E. (Mass.)
Senior Engineer, Raytheon Company,
Electrical Engineering Technology (1965)
- Thomas J. Vaughn, Jr., B.S.
Systems Analyst, U.S. Dept. of Transportation
Engineering Graphics and Computation (1972)
- John F. Videler, B.S., M.S.
Operations Engineer, General Electric Co.
Physics (1968)
- *Thomas H. Wallace, S.B., M.A., Ph.D.
Professor of Physics, Northeastern University.
Program Consultant for Physics (1941)
- *Morton D. Weinert, A.B., Ed.M., M.Ed.
Assistant Headmaster in Charge of Mathematics, Boston Latin School.
Mathematics (1955)
- Joel Weinstein, B.S.
System Sales Schweber Electronics Corp.
Engineering Graphics and Computation (1977)
- James Welch, B.S., M.S.
Prod. Eng. Foxboro Co.
Engineering Graphics and Computation (1977)
- Charles S. Whalen, B.S.M.E., M.S.M.E., P.E. (Mass.)
Research & Development Engineer, Inertial Guidance, Raytheon Company.
Mechanical Engineering Technology (1968)
- *Willard B. Whittemore, B.S., in C.E., Ed.M., C.A.G.S.
Director of Mathematics, Everett Public Schools (Retired).
Course Consultant for Mathematics (1957)
- *Joseph F. Willard, B.S., P.E. (Mass.), R.L.S. (Mass.)
Associate Civil Engineer,
Massachusetts Department of Public Works.
Civil Engineering Technology (1949)
- *Donald K. Willim, B.S., M.S., P.E. (Mass.)
Staff, Massachusetts Institute of Technology, Lincoln Laboratory.
Physics (1961)
- *Albert G. Wilson, Jr., B.S., M.S., P.E. (Mass.), S.E. (Ill.)
Chief Structural Engineer Pace International Corp.
Course Consultant for Mechanical Engineering Technology (1948)
- Kenneth S. Woodard, B.S., M.E., A.G.I. (federal)
Associate Professor, Graphic Science, Northeastern University.
Director, Aviation Technology, Lincoln College.
Academic Counsellor (1967)
- Elliot Wyner, B.S., M.S., Ph.D.
Research Engineer, GTE Sylvania
Physics (1973)

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Walter Zagieboylo, M.S., M.E., P.E. (Mass.)
Research Engineer, U.S. Army Natick Labs.
Mathematics (1969)

Walter P. Zanol, B.S.B.A.
Instructor, Everett High School.
Mathematics (1967)

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Northeastern University

Lincoln College

360 Huntington Avenue

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Telephone 437-2500

_____ 19_____

Please send me an application for admission for:

☐ Lincoln College Evening Programs

☐ Day BET Programs

☐ Will you please arrange for me to have an interview to discuss
your program in _____

☐ I would like to apply for advance standing credit and shall
arrange to submit transcripts of my records at all schools attended
since high school.

Signature

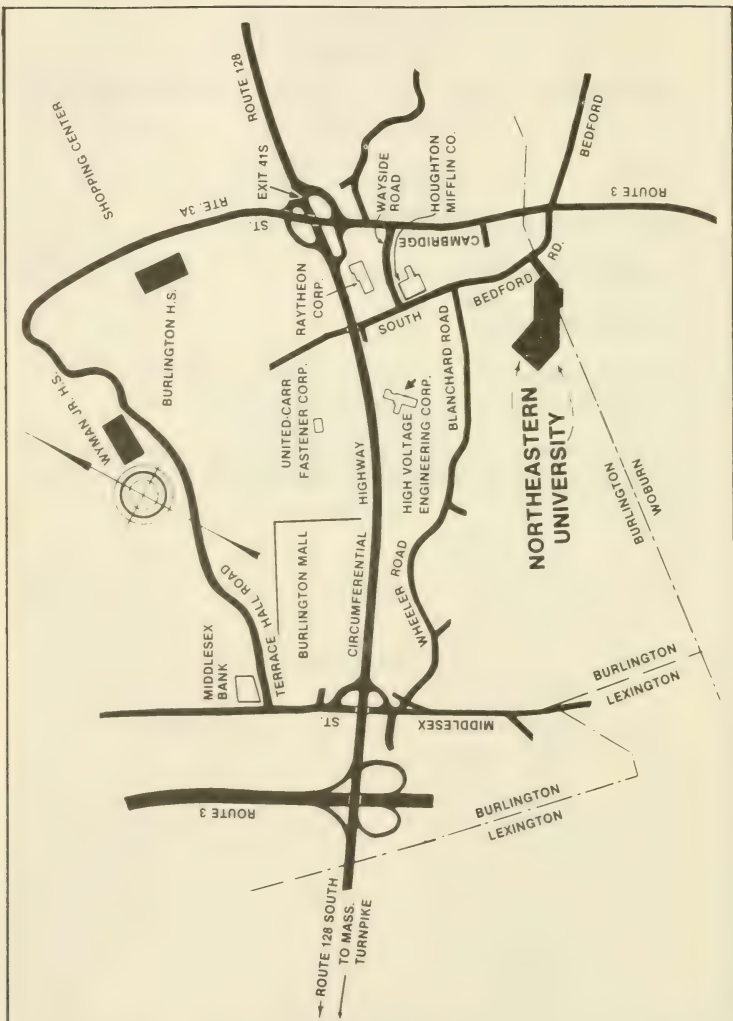
Street Address

City

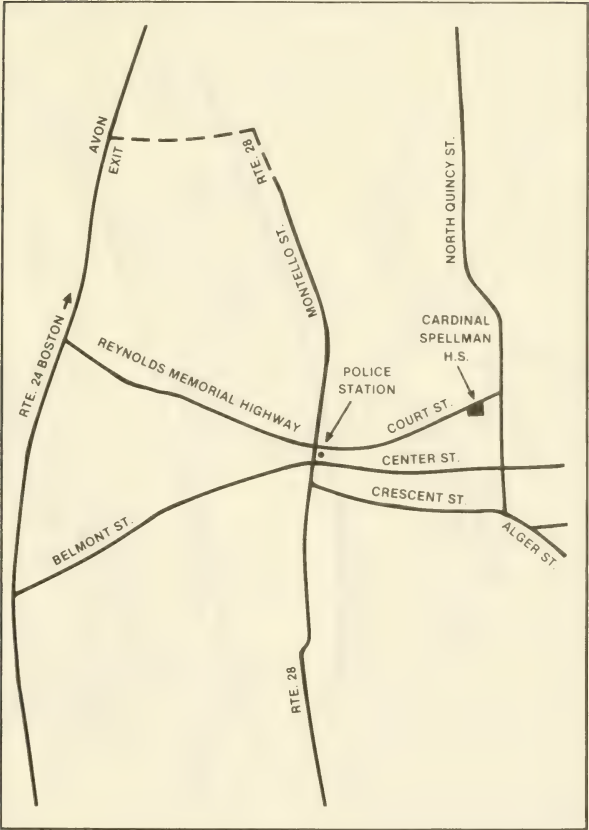
State

Zip Code

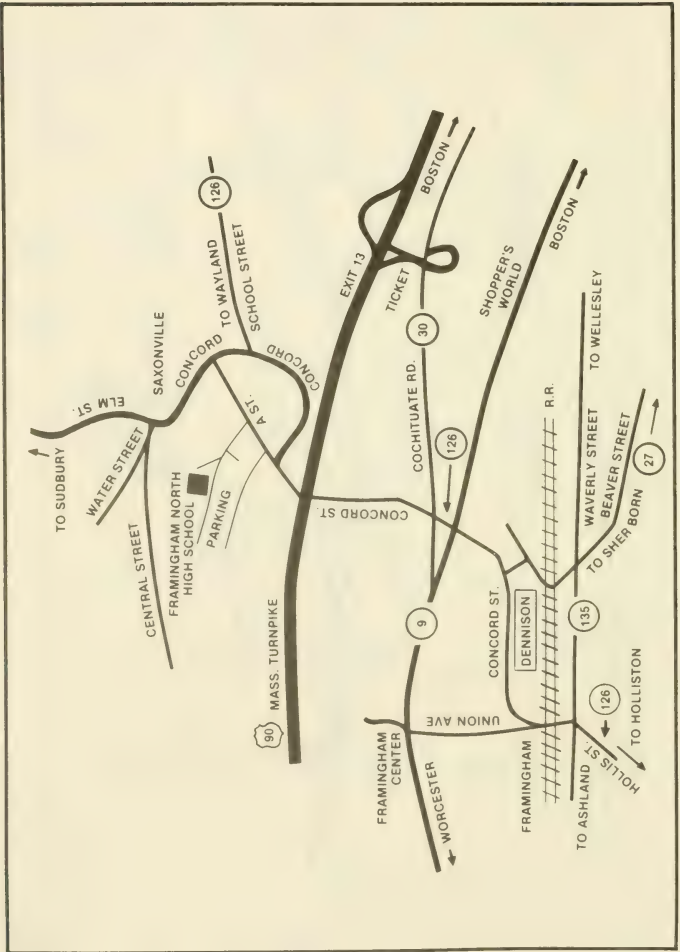
Suburban Campus



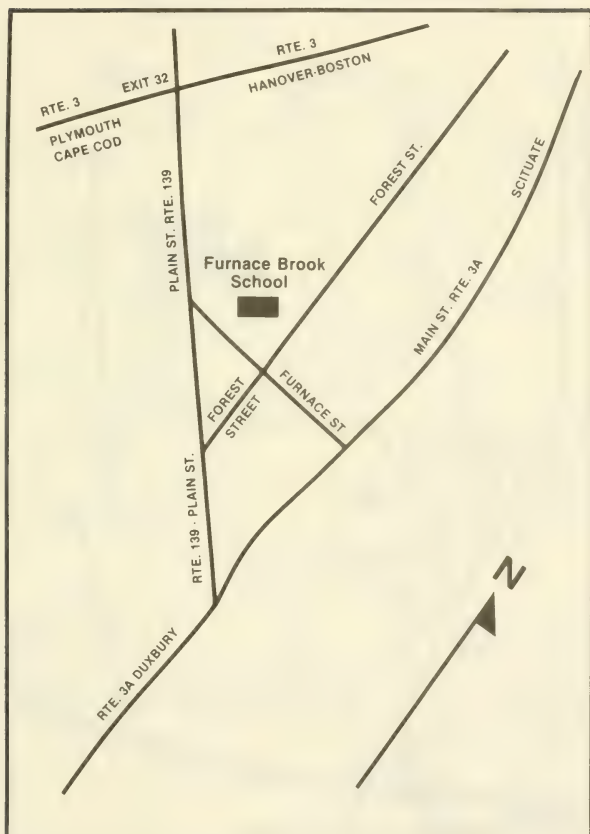
Brockton (Cardinal Spellman High School)



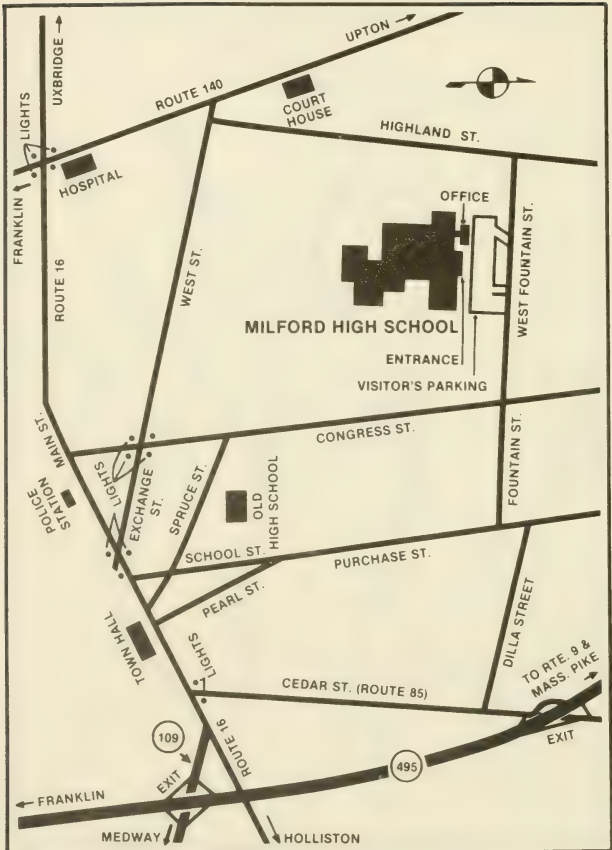
Framingham North High School



Marshfield (Furnace Brook School)



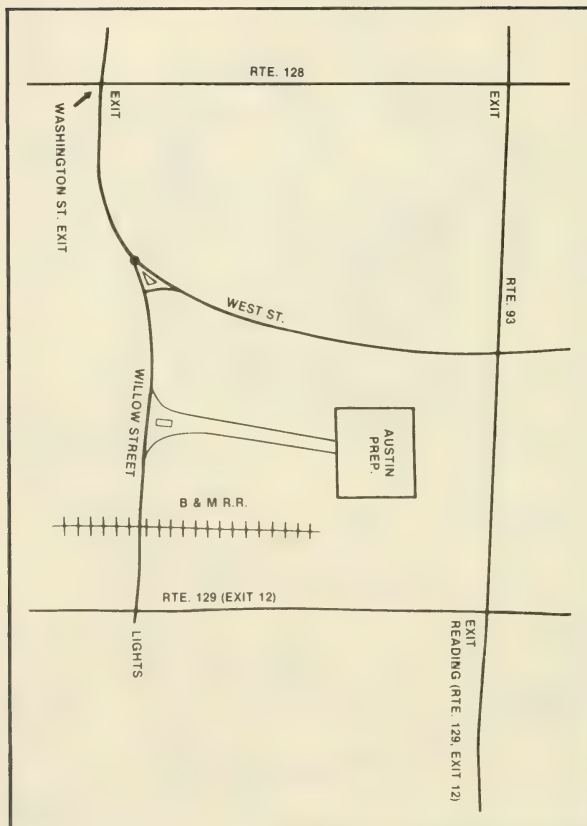
Milford High School



Norwood



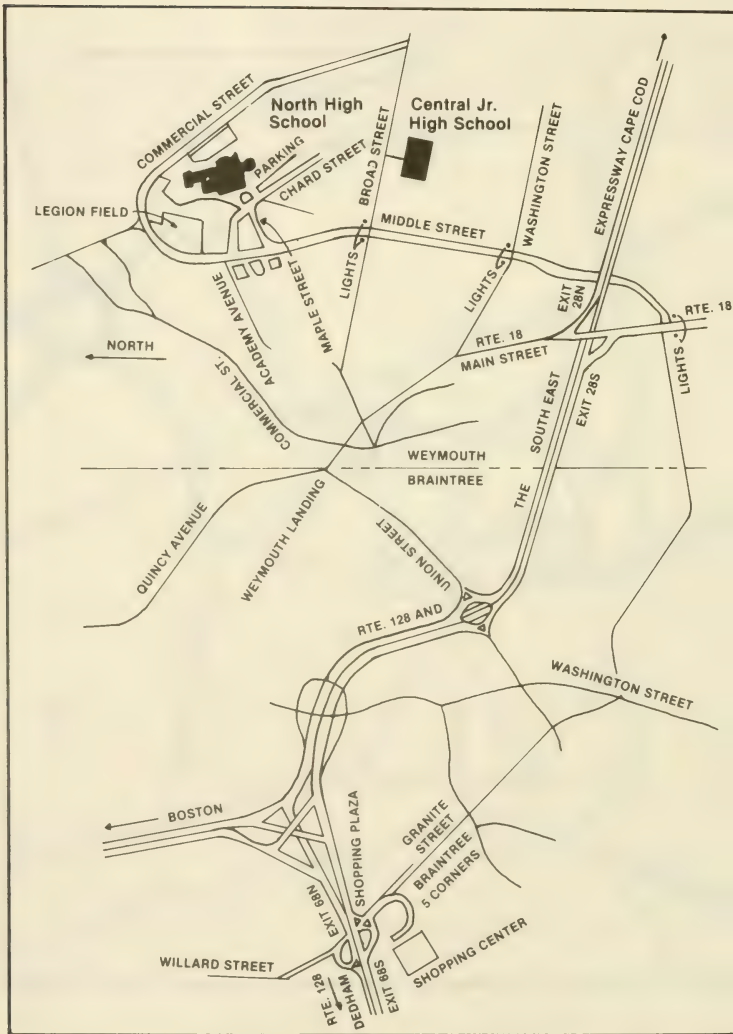
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Revere High School



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Northeastern
University
1978-80

Graduate School of
Engineering

Northeastern University 1978-80

Graduate School of Engineering



NEW ENGLAND
ASSOCIATION
OF SCHOOLS
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FOUNDED IN 1883

214 Hayden Hall
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Important Note to Students

The Northeastern University catalog contains *current information* regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

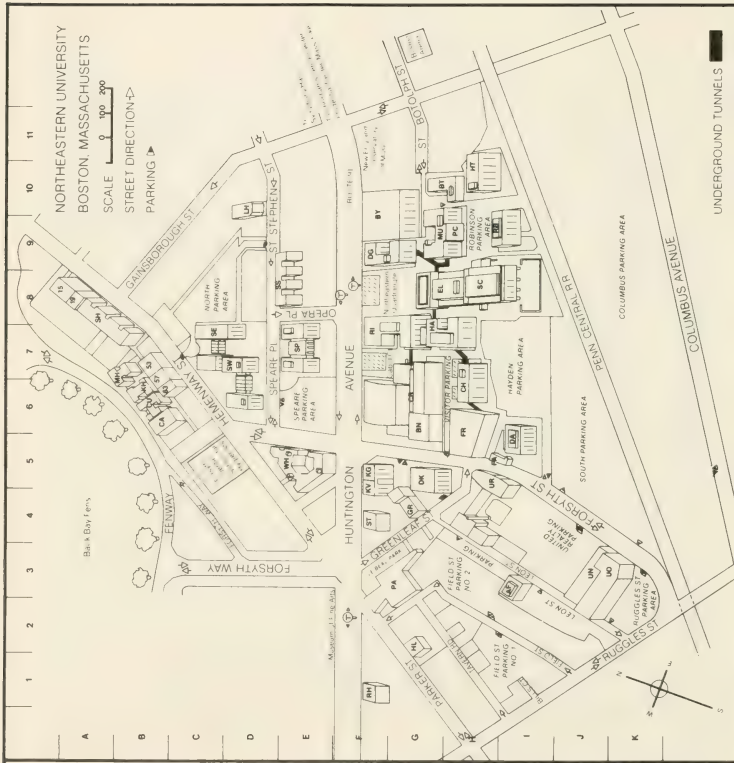
We at Northeastern will do our best to make available to you the finest education we can provide, the most stimulating atmosphere in which to learn, and the most congenial conditions under which you may enjoy the learning experience. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. You will be a full participant in an educational partnership. We will and, indeed, can only make the opportunities available to you; it is up to you to take advantage of them.

This is equally true with your career upon graduation. We cannot guarantee that you will obtain any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state. While we will be ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because we cannot know what your expectations and understandings are unless you tell us.

In brief, what we are saying to you is that we are here to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

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Academic and Service Buildings	Map Code	Bldg Code
African-American Institute	13	AF
Barletta Bldg	G6	BN
Bolton Building	G10	BT
Caplan Physical Education Center	G6	CB
Cabot Hall	H6	CA
Churchill Hall	H6	CJ
Cushing Hall	B6	CU
Dana Research Center	U5	DA
Dockers Hall	G5	DK
Dodge Library	G9	DG
Eli Student Center (Auditorium section)	G8	EL
Eli Student Center (Student Lounge section)	H8	SC
Forsyth Building	H6	FR
Forsyth Building Annex	H5	FA
Greenleaf Building	G4	GR
Hayden Hall	G7	HA
Hillel House	G1	HL
Hurlig Hall	H11	HT
Kerr Hall (Faculty Center)	B6	KH
Knowles Center	F5	KG
Knowles Center (Gryzmish Hall)	F5	KV
Knowles Center (Volpe Hall)	J3	VO
11 Leon Street	J3	UN
15 Leon Street	J3	UN
Mugar Life Sciences Building (Peabody Health Professions Center)	G9	MU
Parker Building	G3	PA
Peabody Center	G9	PC
Richards Hall	F7	RI
Robinson Hall	H10	RB
Stearns Center	F4	ST
United Realty Building	H5	UR
Residence Facilities		
Boston YMCA	F10	BY
115 Hemenway Street	A8	15
119 Hemenway Street	A8	19
153 Hemenway Street	B7	53
157 Hemenway Street	B6	57
163 Hemenway Street	C6	63
Kerr Hall	B6	66
Light Hall	D10	LH
Melvin Hall	B7	MH
Rubenstein Hall	F1	RH
106-122 St. Stephen Street	E8	SS
Smith Hall	B8	SH
Speare Hall	E7	SP
Sielson Hall East	C7	SE
Sielson Hall West	D7	SW
White Hall	E5	WH

ACADEMIC CALENDAR 1978—1979

Fall Quarter 1978

Registration period		
Burlington	Tuesday—Wednesday	Sept. 12—13
Boston	Monday—Thursday	Sept. 18—21
Classes begin	Monday	Sept. 25
Last day to drop a course	Wednesday	Nov. 22
Examination period	Monday—Saturday	Dec. 11—16

Winter Quarter 1978—79

Registration period		
Burlington	Tuesday	Nov. 28
Boston	Monday—Thursday	Dec. 4—7
Classes begin	Tuesday	Jan. 2
Last day to drop a course	Friday	Mar. 2
Examination period	Monday—Saturday	Mar. 19—24

Spring Quarter 1979

Registration period		
Burlington	Tuesday	Mar. 6
Boston	Monday—Thursday	Mar. 12—15
Classes begin	Monday	Apr. 2
Last day to file card for Spring Commencement	Friday	Mar. 30
Last day to pay fee for Spring Commencement	Tuesday	May 1
Last day to drop a course	Friday	June 1
Examination period	Monday—Saturday	June 11—16
Spring Commencement	Sunday	June 17

Summer Quarter 1979

Registration period		
Burlington	Monday—Tuesday	June 11—12
Boston	Wednesday—Thursday	June 13—14
Classes begin	Monday	June 25
Last day to file card for Fall Commencement	Friday	July 6
Last day to pay fee for Fall Commencement	Wednesday	Aug. 1
Examination period	Wednesday—Thursday	Aug. 1—2

UNIVERSITY HOLIDAYS 1978—79

Columbus Day	Monday	October 9
Veterans Day	Saturday	November 11
Thanksgiving Recess	Thursday—Saturday	November 23—25
Christmas Vacation	Monday—Monday	Dec. 18—Jan. 1
Martin Luther King Day	Monday	January 15
Washington's Birthday	Monday	February 19
Patriot's Day	Monday	April 16
Memorial Day	Monday	May 28
Independence Day	Wednesday	July 4
Labor Day	Monday	September 3

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer and/or the Title IX coordinator.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. Radio stations WBZ, WEEL, WHDH, WJDA, WCOP, WRKO, WLYN, WKOX, WHAV, and WLLH will announce the University's decision to close.

In addition, the University maintains an emergency snow phone (262-SNOW). Whenever in doubt, call 262-SNOW and a taped message will indicate the status of classes.

the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of nearly 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not attempted to duplicate the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouv  College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method offers students the opportunity to gain valuable practical experience as an integral part of their college program and often provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of

Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degrees of Master of Education, Doctor of Education, and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 50 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, Health Education, Physical Education, Recreation and Leisure Studies, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 412,000 volumes supplemented by some 333,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,700 periodical titles, 100,000 documents, and 10,000 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

The Barletta Natatorium houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, a darkroom, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Apartments for Upperclass Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A \$100 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first-come, first-served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland,

completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is located 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is located about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

Government Center Campus

With the cooperation of the Federal Executive Board, the Graduate School of Liberal Arts, Department of Political Science offers an entire Master of Public Administration program at the John F. Kennedy Building in downtown Boston. This program is primarily for individuals employed in federal, state, or local civil services.

regulations of the graduate school of engineering

The Master of Science degree may be earned in Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering, and Engineering Management. In addition, there are programs leading to the Doctor of Philosophy degree in Chemical Engineering, Civil Engineering, Electrical Engineering, and Mechanical Engineering. The Doctor of Engineering degree is offered in Chemical Engineering. The Engineer degree may be earned in Electrical Engineering, Mechanical Engineering, and Industrial Engineering.

Cooperative Programs

A unique feature of Northeastern's Graduate School of Engineering is the full-time Cooperative Education Plan. This program adopts the philosophy that a balanced exposure to theory and practice will provide students with a more meaningful education.

The program includes nine months of classroom study and twelve months of work experience in an industrial concern. The cooperative student has the opportunity to gain vital experience in a professional environment while also supplementing his tuition payments.

The University has a full-time experienced staff to assist the student in obtaining a cooperative work assignment. The student may also wish to investigate employment opportunities on his own in order to facilitate final placement by the graduate coordinator.

An illustration of term sequence within the two-year Cooperative Education Plan is shown below:

	First Year	Second Year
Fall Quarter	class	work
Winter Quarter	work	class
Spring Quarter	class	work
Summer Quarter	work	

Normally, the Cooperative Plan operates as shown above. Economic conditions, the military, citizenship, and other factors may cause a departure from the normal Plan.

Engineering Sponsorships

Another aspect of Cooperative Education is the Engineering Sponsorship Program. This program provides students with exposure to academic theory and industrial experience. The sponsoring company, by employing the students during cooperative work quarters, provides a monthly salary for the two (2) year period plus a tuition stipend.

All students who are accepted as full-time cooperative students are considered for Engineering Sponsorships. Notification will be received prior to April 15th if a student has been chosen for a sponsorship. Those students not chosen are still eligible for placement under the Cooperative Plan of Education.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Application Procedures

All applicants for cooperative full-time or continuous full-time study at the master's level should address inquiries to their respective departments or to the Graduate School of Engineering. Application forms and reference blanks will be mailed to the applicant. This material, together with the \$15.00 non-refundable application fee, necessary transcripts, two letters of recommendation, the Graduate Record Examination scores when required, and the results of the Test of English as a Foreign Language (required of all applicants whose native language is not English), should be returned to the Graduate School of Engineering Office as soon after January 15th as possible. The Admissions Committee will notify applicants as soon as their material is complete.

All applicants for part-time study at the master's level should request an application from the Graduate School of Engineering Office. The completed application, the non-refundable \$15.00 application fee and an official transcript should be sent to the graduate school no later than two weeks prior to the registration period for the quarter in which the applicant plans to begin his program. The dates of the registration periods are announced in the catalog (see academic calendar) and in the circular issued each July. Applicants will be notified by mail regarding acceptance. Mailed applications will be accepted up to two weeks prior to the registration period for the quarter in which the applicant plans to begin the program.

If an applicant is unable to submit the application material by mail at least two weeks prior to the registration period, he should call the Graduate School Office to arrange for a personal interview to determine his

qualifications for admission. The application, the non-refundable \$15.00 application fee and the official transcript may be submitted at the interview.

In some cases, the Graduate Record Examination may be required of applicants. The examination is administered by the Educational Testing Service, Box 955, Princeton, New Jersey, 08540. Applicants must make their own arrangements with the Educational Testing Service for the examination.

Test scores for Graduate Record Examinations and Test of English as a Foreign Language sent to the Graduate School of Engineering are retained for only one year from the date they were taken. If an applicant does not enroll in the quarter for which he was accepted, but delays his registration for a period of one year or more from the date that he originally took his examinations, he must repeat the examinations or resubmit the original test scores before he will be permitted to register.

Transcripts

Official transcripts of previous college training must be supplied with the mailed application if an admissions decision is to be rendered by return mail, or submitted at the personal interview. If this is not feasible, the official transcripts must be mailed to the Graduate School of Engineering as soon after the initial registration as possible. Students who have attended institutions outside of the United States should provide comparable certified documents. Students failing to file the necessary transcripts within one academic quarter after acceptance will be withdrawn from the Graduate School of Engineering.

Admission

To be admitted for graduate work, an applicant must have obtained a Bachelor of Science degree in engineering or a closely related science from a recognized college or university with an acceptable quality of undergraduate work. His scholastic record, therefore, must show ability to pursue creditably a program of graduate study, and his undergraduate training must indicate breadth as well as adequate preparation in the field in which the applicant expects to do advanced work. Acceptance to the school is granted upon recommendation of the departmental graduate committee or its designate following a review of the application and supporting material. The recommendation is based upon promise of academic success and fulfillment of minimum criteria established by each department in the Graduate School of Engineering.

Students with an engineering or related science bachelor's degree, who are enrolled in another graduate school at Northeastern, may transfer to the Graduate School of Engineering. However, they must make application and file the necessary documents, the same as transfers from other colleges or universities. The submission of registration materials for engineering course work does not constitute enrollment in the Graduate School of Engineering.

Registration

Students must register within the dates and times listed on the school calendar. The place of registration will be announced prior to each period.

Auditors are not permitted. All students attending any course in the Graduate School of Engineering must be officially registered by the Registrar and listed on the class roster.

Residence

All work for advanced degrees must be completed at the University unless approval has been obtained from the director of the graduate school for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

Programs of Study

The curricula of the degree programs are given under each departmental heading. The descriptions of courses offered by the several departments are given so that prospective students may obtain a view of the course coverage. Preparation courses are indicated when necessary. Not all courses are offered every year, but the course offerings will be arranged in such a manner that students may make continuous progress toward the degree.

The Graduate School of Engineering issues a circular close to July 1st which gives the courses for the following academic year and the times at which they meet.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level. The University reserves the right to cancel, postpone, combine, or modify any course.

At the time of his first registration, each full-time student must develop, with the assistance of his faculty adviser, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty adviser.

Part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per quarter (one course in the summer) unless special permission to carry a heavier load is given by the director of the graduate school.

Grading System

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory

This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I Incomplete

This grade is given to those students who fail to complete the work of the course.

S Satisfactory without quality designation.

U Unsatisfactory without quality designation.

These grades are used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence. The designations S and U may also be used for thesis and seminar work.

Incomplete Grades

The I grade will be changed to a letter grade upon removal of the deficiency which caused the grade of I to be reported. Deficiencies must be made up within the quarter following that for which the grade of I is received unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters.

Any student who wishes to make-up a final examination must obtain permission from the director of the graduate school by the second week of the quarter succeeding that in which the examination was missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission of the director to defer it to one of the next two quarters.

A student who has attained an inordinate number of incompletes may, at the discretion of the Committee on Graduate Study in Engineering be asked to withdraw for failure to show continuous progress toward the degree.

Class Hours and Credits

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar in the front of this catalog should be consulted for the opening and closing dates of each academic quarter.

Continuity of Program

Students are expected to maintain continuous progress toward the degree. Any student who has not completed a course within one year must apply to the director for readmission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they fill out the official withdrawal form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Requests for withdrawal from a course after the ninth class meeting of the quarter may be submitted to the Director of the Graduate School, and may be approved to avert unusual hardships on a student.

Changes in Requirements

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Filing for the Degree

Each student who plans to graduate either in June or September must submit to the Registrar's Office a completed commencement data card prior to the deadline listed in the academic calendar for that commencement at which he expects to receive the degree. If the deadline for filing is not met there is no assurance that the degree will be awarded that year. The commencement data card is supplied with the registration materials or is available in the Registrar's Office.

THE MASTER'S DEGREE

Admission

Specific requirements for each degree program will be found in the appropriate paragraphs for each academic department in the Graduate School of Engineering. General Requirements are listed under *Application Procedures*.

Academic Classifications

Students initially entering the Graduate School are classified into one of three groups according to their admission qualifications.

Regular students are those who meet in full all admittance criteria based on the standards established by the Committee on Graduate Study in Engineering.

Provisional students are those whose records are above the minimum required for acceptance but do not qualify them for regular admission based on the standards established. Therefore, provisional students must obtain a B average in their first 12 quarter hours of course work to continue in the graduate school and be reclassified as regular.

Special students are those who do not wish to pursue a master's degree program or who may already possess the master's degree. Special students with only the bachelor's degree must meet the same admission criteria as the regular or provisional student and will be limited to a maximum of 12 quarter hours of graduate credits.

Any student whose record is not satisfactory may be dropped from the program regardless of his classification.

Academic Requirements

A candidate for the master's degree must satisfactorily complete an approved program consisting of a minimum of 40 quarter hours of correlated work of graduate caliber and such other study as may be required by the department in which he is registered.

To qualify for the Master of Science degree from the Graduate School of Engineering each student must have an average grade accumulative of not less than B with no more than 12 credits below a B in all courses undertaken at Northeastern University. The Committee on Graduate Study in Engineering allows eight quarter hours of credit to be taken, in addition to the stated degree requirements, to repeat failed required courses or to substitute for elective courses to obtain the required B average for completion of degree requirements. The number of I grades that a student may accrue will be limited.

Within the above limitations for extra or repeated courses, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

Comprehensive Examination

At the discretion of the department, a final written or oral comprehensive examination may be required. Such examinations will be given at least two weeks before the commencement at which the degree is expected.

Thesis

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material, and must

meet the approval of the departmental graduate committee.

The thesis must receive a grade of B or better to be accepted. Instructions for the preparation of the thesis may be obtained from the department.

Transfer Credits

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided that the credits transferred are in the candidate's field, consist of work taken at the graduate level for graduate credit, carry grades of A or B, have been earned at a recognized college or university, and have not been used toward any other degree. Students should petition the Graduate School of Engineering in writing for all transfer credits. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the graduate school committee.

Fellowships

The departments of the Graduate School of Engineering have two types of fellowships, available on a limited basis. Some departments have teaching assistantships and research fellowships for students enrolled in work leading to the master's degree. The departments which give doctoral degrees also have research fellowships for such students.

Assistantships

Some departments have limited teaching assistantships, on the Cooperative Plan, in which students alternate full-time academic work with full-time work in the department. Some departments also have available research fellowships. Applications for traineeships must be filed by March 15, with two letters of recommendation and a transcript of all prior college work. All students must have their course program approved by the chairman of the respective department before the student registers.

Cooperative Programs

All the departments offer the Cooperative Education Plan. The Plan consists of nine months of classroom study and twelve months of work experience in an industrial concern.

Full-Time Program

All the departments offer a continuous full-time program in which the requirements for the master's degree can be completed in one academic year.

Part-Time Program

Most of the departments offer part-time programs in which the admission requirements are the same as for full-time programs. However, the program is established in such a way that students may progress according to their abilities and the time available. The curricula of the part-time programs are specified by the departments.

An official transcript of prior college work must be submitted with an application by those who apply by mail, or at the personal interview for those who apply after the deadline for mailing. Mail applications will be accepted up to two weeks prior to the registration period for the quarter in which the applicant plans to enter the Graduate School.

Honorary Societies

Northeastern University has chapters of Tau Beta Pi, Sigma Xi, and Phi Kappa Phi. Graduate students are eligible for consideration for election to these societies in accordance with the admission requirements of each organization.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school, depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School of Engineering the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. **Doctoral Student**

Students in this classification have been admitted to a doctoral program.

2. **Doctoral Degree Candidate**

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

3. Special Students

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Philosophy degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in his field.

Course Requirements

The minimum course requirements of 40 quarter hours constitute the work normally required for a master's degree. The course requirements beyond this are the doctoral course requirements and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program. The original bound copy of the dissertation must be deposited in the library.

Language Requirement

The foreign language requirement and how it is satisfied is established by the committee in charge of each degree program.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the director of the graduate school is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs of the University Graduate Council for such extension.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

THE DOCTOR OF ENGINEERING DEGREE

The Doctor of Engineering degree is awarded to candidates who give evidence of high attainment and ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school, depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School of Engineering the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. Doctoral Student

Students in this classification have been admitted to the doctoral program.

2. Doctoral Degree Candidate

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

3. Special Students

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Engineering degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in this field.

Course Requirements

The minimum course requirements of 40 quarter hours constitute the work normally required for a master's degree. The course requirements beyond this are doctoral course requirements, and the amount of such

work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

The dissertation for the Doctor of Engineering degree is fundamentally different from that of the Doctor of Philosophy degree. In general, the latter focuses on contributions to new knowledge in the engineering sciences and is expected to demonstrate the student's competence as a researcher. The dissertation for the Doctor of Engineering degree focuses on creative engineering design and in-depth engineering studies. It may, and usually will, contain elements that involve research, but above all, it must demonstrate the student's ability to work creatively on engineering analysis and design problems such as those encountered in professional practice.

Language Requirement

There is no foreign language requirement, but, in lieu of such a requirement, the student must demonstrate proficiency in computer software techniques and an acceptable machine language.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the director of the graduate school is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs or the University Graduate Council for such extension.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first

registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

Professional Experience

The student is required to present evidence of at least one calendar year of experience in engineering practice at a suitable professional level. This experience must have been acquired after completion of a bachelor's degree in a branch of engineering. The committee in charge of each degree program specifies the details of the professional experience requirement.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more departments. To meet this need, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following plan is in operation:

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the director of the graduate school, who directs it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral thesis. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the director of the graduate school to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The

chairman of the registration department will notify the director of the graduate school of the membership of the committee as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the director of the graduate school to determine whether objectives of the program are being met.

THE ENGINEER DEGREE

The degree of Engineer is intended for those who do not wish to make a commitment to post-master's degree graduate study that is as extensive as that required for one of the doctor's degrees. It is an intermediate degree, between master's and doctor's degrees. A student who has completed the Engineer degree is eligible to apply for admission to a doctor's degree program.

Admission

Each departmental Engineer degree program has its own admission procedure for students beginning the program. Normally a master's degree in engineering or related field is required. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

A student admitted to the Engineer degree program will be designated as a candidate for this degree.

Residence Requirement

Candidates for the Engineer degree must spend the equivalent of at least two academic quarters in residence at the University taking graduate work.

The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying and Comprehensive Examinations

The committee for each Engineer degree program specifies its own examinations. Normally, no qualifying examination is required for candidacy and no comprehensive examination is required for completion, but individual departments offering the degree may require such examinations.

Course Requirements

The minimum course requirement will be 40 quarter hours beyond the master's degree, with no more than 10 quarter hours of credit out of the 40 allowed for work on the dissertation. A minimum of 20 quarter hours must be taken in the department in which the degree is offered. Specific course requirements for each Engineer degree program are determined by the departmental committee in charge of the program.

Dissertation

Each Engineer degree student must complete a dissertation which demonstrates a high level of competence in engineering research, development, or design. As a general guideline, the amount of effort normally expected will be the equivalent of about 10 quarter hours of graduate course work.

Language Requirement

No foreign language is required for the Engineer degree.

Final Oral Examination

A final oral examination may be required by the departmental committee in charge of the Engineer degree program. The examination will normally consist of a defense of the dissertation.

Transfer of Credit

Approval for transfer of credit must be given by the departmental committee in charge of the degree program.

Time Limitation

After admission to the program, a maximum of five years will be allowed for completion of the degree requirements. Extension of this time limit may be granted with the approval of the departmental committee in charge of the degree program.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for this work, registration must be continuous unless withdrawal is allowed by the departmental committee in charge of the degree program.



financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates and fees are subject to revision by the Board of Trustees at any time. However, any change in tuition and fees will become effective at the beginning of the school year which follows the one in which the change was announced.

The tuition rate for all graduate students is \$81 per quarter hour of credit. Doctoral candidates actively utilizing the resources of the University in their Doctor of Philosophy or Doctor of Engineering dissertation are charged an additional \$600 per quarter. Those doctoral candidates registered for dissertation work to be performed off campus are charged \$200 per quarter in addition to tuition. Degree candidates that are no longer full time students yet still need to complete thesis or dissertation requirements will be charged a continuation fee. This will entitle the student to limited access of various University facilities and privileges.

Tuition statements are mailed to students by the Bursar's Office and are payable by cash or check to Northeastern University on or before the date specified.

Fees

A \$15.00 non-refundable application fee must accompany the application for admission to the Graduate School of Engineering. No applications will be processed until the fee has been received.

Upon notification of acceptance, all full-time applicants are required to pay a tuition deposit of \$50.00. This deposit will be credited to the student's tuition, and it is not refundable for those who do not register.

Other fees include a charge of \$10 for the payment of tuition and a commencement fee of \$25 for all degree candidates, payable before commencement by the date listed in the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. The fee for teaching assistants and research fellows is \$6.25 each quarter. All part-time students on the Huntington Avenue Campus are charged \$.75 a quarter.

All full-time students pay a non-refundable University Health Service fee of \$140 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the students to the medical care furnished by the University Health Services.

All financial obligations to the University must be discharged by graduation.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not

constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:
Amount of Refund:

Official Withdrawal Filed Within:	Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

DEPARTMENTAL FINANCIAL AID

The Graduate School of Engineering has available the following types of assistantships and fellowships for support of graduate students. Those interested in financial aid must apply through the chairman of the major department. The chairmen or representatives of the Department are listed in the catalog under the Committee on Graduate Study in Engineering.

Teaching Assistantships

Teaching assistantships allowing remission of tuition and a stipend are available in all departments. Holders of such awards devote half time to academic assistance directly related to the teaching function and the balance to course work.

Graduate Administrative Assistantships

Some University Departments offer the graduate student an opportunity for remission of tuition and a stipend in return for half time spent in assisting with non-teaching, administrative duties.

Tuition Assistantships

Many departments provide remission of tuition for students who share in the administrative work of the department. These awards are normally given to full-time students in the first year of graduate work.

Research Fellowships

A number of departments offer research fellowships including N.I.H. and N.S.F. that carry a stipend and remit tuition. Certain of these grants require half-time work on research in the department, with the remaining time devoted to course work. Others provide for full-time work on research used for thesis or dissertation.

Doctoral Research Fellowships

In the departments which give work leading to the Ph.D. degree, research

fellowships available for students who have established candidacy for the Ph.D. degree carry a higher stipend than fellowships at the master's level.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty advisers and the director of the graduate school.

FINANCIAL AID OFFICE

The Office of Financial Aid offers two types of Federal assistance to graduate students: the National Direct Student Loan and Work-Study. All awards are based on financial need. Aid granted from these programs sponsored by the Federal Government is dependent upon the amount of funds allocated to Northeastern University.

Northeastern University is a participant in the Graduate and Professional School Financial Aid Service (GAPSFAS). All applicants for financial aid must file a GAPSFAS form in order to be considered. This form may be obtained from the financial aid officer at the institution which the student now attends or from the Northeastern University Office of Financial Aid. All sections of the GAPSFAS form must be completed and sent to the Graduate and Professional School Financial Aid Service, Box 2614, Princeton, New Jersey 08540. No decision on an application for financial aid will be made until the GAPSFAS form is received.

Only students who have been officially accepted as degree candidates to a graduate school of Northeastern University may apply for financial aid. The University does not award financial assistance to students who are not citizens or permanent residents of the United States.

National Direct Student Loan

Under the National Direct Student Loan program, students may be allowed to borrow as much as \$1500 per academic year; however, the total amount borrowed must not exceed \$10,000 for the students entire undergraduate and graduate program. Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load. The repayment of the principal may be extended over a ten-year period with an interest rate of 3% per annum.

College Work-Study Program

The College Work-Study Program is sponsored by the Federal Government. It is designed to give students an opportunity to earn as much as \$3.75 per hour working in jobs on or off campus in public or private non-

profit organizations. This program is administered solely by the Office of Financial Aid and should not be confused with the University's Cooperative Education Program.

Guaranteed Student Loan Program

A prime means of financial assistance is the Guaranteed Student Loan Program. Because of the easy availability of this loan relative to other types of financial assistance, it is recommended that all applications for aid first seek assistance from this source. Students may receive guaranteed loans of up to \$5000 per academic year from their local banks. Repayment of the principal and interest need not begin until nine months after the student ceases to carry at least a half-time academic load.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Dr. Martin Luther King, Jr., awards are made as openings occur to a limited number of qualified minority graduate students who show financial need and are accepted to full-time study in the graduate schools of the University. Stipends will cover tuition and all fees. Students should contact the African-American Institute for more information.

Acceptance Conditions

Northeastern University, which is a member of the Council of Graduate Schools of the United States, subscribes to the following resolution of the Council:

Acceptance of an offer of financial aid (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by an actual or prospective graduate student completes an agreement which both student and graduate school expect to honor. In those instances in which the student accepts the offer before April 15 and subsequently desires to withdraw, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer.

faculty

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civil engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Civil Engineering, applicants must have obtained a Bachelor of Science degree in Civil Engineering, with an acceptable quality of undergraduate work, from a recognized institution. Applicants with a Bachelor of Science degree from a recognized institution in some other engineering field or related science and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science.

THE MASTER'S DEGREE

General

The master's degree requirements can be completed on the Cooperative Plan, on a full-time basis or part-time in the evening. Forty quarter hours of academic work are required. A master's report carrying 4 q.h. of credit, or a thesis of 8 q.h. credit is required in all fields of civil engineering (environmental, structural and transportation).

A meaningful sequence of electives must be chosen which meets the approval of the department. Department interviews are necessary early in the program for all students in order that an approved program of electives may be arranged with the individual. It is suggested that only required courses be taken in the first quarter. During that quarter an interview should be scheduled within the department for preliminary planning of the remainder of the individual program.

Full-Time Program on the Cooperative Plan

On the Cooperative Plan students enroll for academic work in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

Full-Time Program

Arrangements may be made to complete the degree requirements in one year on a continuous full-time basis.

Part-Time Programs

The admission requirements for these programs are similar to those for the full-time program, but students may progress according to their ability

to combine their study load with their employment load. A maximum of seven years is allowed to complete the program.

Substitutions

With the approval of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which offer graduate work.

STRUCTURAL ENGINEERING

The Structural Engineering Program emphasizes basic courses in Structural Analysis, Design of Steel and Concrete Structure, and Soil Mechanics. Advanced topics in Dynamics, Stability, and Numerical Methods round out a comprehensive presentation which may be supplemented by offerings from other programs, such as mechanical engineering or industrial engineering.

SPECIMEN FULL-TIME PROGRAM

Fall Quarter **Credits**

1.847	Structural Analysis	4
1.853	Concrete Structures I	2
1.877	Eng. Props. of Soils	4
1.861	Design of Structures I	2
1.886	Soil Dynamics I	2
1.859	Structural Stability	2
	or	
1.882	Engineering Geology	2
		<u>14</u>
		(Minimum)

Winter Quarter **Credits**

1.854	Concrete Structures II	2
1.862	Design of Structures II	2
1.887	Soil Dynamics II	2
1.894	Numerical Methods in Struct. Mechanics	4
1.897	Master's Report	4
	or	
1.899	Thesis	8
		<u>14</u>
		(Minimum)

Spring Quarter **Credits**

1.850	Seismic Design I	2
1.855	Concrete Structures III	2
1.857	Structural Dynamics	4

1.863	Design of Structures III	2
1.878	Foundation Engineering	4
		(Minimum) 12

The two-credit courses are scheduled for the early evening time block.

PART-TIME PROGRAM

Required Courses		Credits
1.897	Master's Report	4
or		
1.899	Thesis	8
		(Minimum) 4

Electives (Part-time Program)

Students in the Structural Engineering major must elect 30 quarter hours from civil engineering courses within the structural engineering field (courses in the 840-899 series).

Six quarter hours may be elected from any courses in engineering or science for which the student has the necessary preparation.

The electives will normally be available according to the following schedule:

Fall Quarter		Credits
1.841	Structural Analysis I	2
1.844	Structural Analysis IV	2
1.853	Concrete Structures I	2
1.859	Structural Stability	2
1.861	Design of Structures I	2
1.871	Eng. Props. of Soils I	2
1.874	Foundation Eng. I	2
1.882	Eng. Geology	2
1.886	Soil Dynamics I	2

Winter Quarter		Credits
1.842	Structural Analysis II	2
1.850	Seismic Design I	2
1.854	Concrete Structures II	2
1.862	Design of Structures II	2
1.872	Eng. Props. of Soils II	2
1.875	Foundation Eng. II	2
1.887	Soil Dynamics II	2
1.892	Numerical Methods in Struct. Mechanics I	2

Spring Quarter**Credits**

1.843	Structural Analysis III	2
1.849	Model Analysis	2
1.851*	Seismic Design II	2
1.855	Concrete Structures III	2
1.863	Design of Structures III	2
1.873	Soils Testing Lab.	2
1.876	Foundation Eng. III	2
1.893	Numerical Methods in Struct. Mechanics II	2

TRANSPORTATION ENGINEERING

The Transportation Engineering Program is designed for students with career goals in transportation engineering, planning, or research. This program may consist of courses from engineering, liberal arts, and business. A minimum of 40 credit hours is required for a graduate degree.

A Master of Science in Civil Engineering degree will be awarded to students who have an accredited undergraduate degree in civil engineering and have completed at least 24 quarter credit hours in civil engineering courses, i.e. courses designated with 01. - numbers. A Master of Science degree will be awarded to students who do not have an undergraduate degree in civil engineering or who do not meet the minimum 24 quarter credit hour requirement in civil engineering courses. A student may elect to take non-technical electives in liberal arts and business administration. A maximum of nine credit hours in non-technical fields will be allowed.

Each student is required to prepare a program of study which must be reviewed and approved by his faculty adviser. A typical program of study would normally consist of courses shown in the specimen program. Specimen programs listed below for day and part-time students are intended to show the nature of the program. Substitutions for the courses listed in the specimen programs may be made depending on the student's interest, academic background, and career objectives.

For a complete listing of courses and course descriptions, consult appropriate sections of the graduate school catalogues for Engineering, Liberal Arts, and Business Administration. Further information can be obtained within this catalogue under *Graduate Program in Transportation*, which describes the interdisciplinary program in transportation leading to a Master of Science in Transportation degree.

SPECIMEN PROGRAM**Required Courses****Credits**

1.234	Transp. Analysis & Planning	4
1.800	Systems Analysis I	4
1.805	Traffic Flow Theory	4
1.838	Master's Report (Transp.)	4
or		
1.839	Thesis (Transp.)	8

* Alternate Years

Suggested Technical Electives

Courses	Credits
1.206 Applied Probability for Civil Engineers	4
1.207 Technology Assessment	4
1.820 Transp. Engineering	2
1.806 Urban Transp. Analysis	4
1.819 Environmental Impacts of Urban Transp.	4
1.801 Systems Analysis II	4
5.916 Engineering Analysis Utilizing Data Processing	2
5.960 Probability and Statistics I	2
5.961 Probability and Statistics II	2
5.962 Probability and Statistics III	2
5.913 Data Processing for Engineers	2
5.914 Advanced Operations Research	4

Suggested Non-Technical Electives

Courses	Credits
22.847 The Politics of Transportation	3
39.9L5 Economics of Urban Transp.	3
39.9P3 Regional Development	3
39.9R1 Development Planning	3
22.842 Techniques of Urban Planning	3
22.841 Problems in Urban Planning	3
39.9L7 Economics of Inter-City Transportation	3
48.805 Urban Transportation	3
48.801 Seminar in Intercity Transportation	3
39.9L1 Urban Economics I	3
39.9L2 Urban Economics II	3

PART-TIME PROGRAM

Part-time students are subjected to the same requirements as full-time students. Courses listed above may be taken by part-time students. Some of these courses are not available in the evening, but appropriate substitutions may be made.

ENVIRONMENTAL ENGINEERING

Includes areas of specialization such as water resources engineering, water and wastewater engineering, environmental health, air pollution control and solid waste management. A full-time program on the Cooperative Plan is available.

Part-time students and full-time students not on traineeships or grants-in-aid have the option of undertaking either a Master's Report for 4 q.h. credit or a Master's Thesis for 8 q.h. credit. (Students on traineeships or with grants-in-aid may be required to complete a Master's Thesis.)

Suggested programs for both full-time and part-time students are given below. Other programs, tailored to meet individual requirements, may be developed through conferences with the student's adviser.

SPECIMEN DAY PROGRAM

First Academic Quarter		Credits
1.914	Water & Wastewater Treatment	4
*1.923	Environmental Chem.	4
1.933	Environmental Anal.	4
	Elective	<u>2</u>
		14
Second Academic Quarter		Credits
1.922	Env. Bacteriology	2
	Electives	<u>12</u>
		14
Third Academic Quarter		Credits
1.912	Water & Wastewater Treatment III	2
	Electives	6 or 2
1.933	Master's Report	4
	or	
1.991	Thesis	<u>8</u>
		(Minimum) 12

PART-TIME PROGRAM

Required Courses		Credits
1.910	Water & Wastewater Treatment I	2
1.911	Water & Wastewater Treatment II	2
1.912	Water & Wastewater Treatment III	2
*1.920	Env. Chemistry I	2
*1.921	Env. Chemistry II	2
1.922	Env. Bacteriology	2
1.930	Env. Analysis I	2
1.931	Env. Analysis II	2
1.993	Master's Report	4
	or	
1.991	Thesis	<u>8</u>
		20 or 24

* These required courses may be waived for those students who have taken Northeastern course 1.223, Environmental Chemistry, or equivalent. Course 1.933 or courses 1.930 and 1.931 will be required of all students.

Elective Groupings (Day and Part-Time)

Forty (40) quarter hours of academic work are required for the degree, including certain approved electives which are available from other departments. To provide a meaningful grouping of the available technical electives, one of the following sequences of courses must be selected. These are the required courses for each area of specialization. A minimum of 14 quarter hours of elective courses must be obtained from the environmental engineering courses offered by the Civil Engineering Department (900 series). Exceptions to these requirements must receive permission from the Graduate Environmental Committee.

Water and Wastewater Engineering	Credits
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1.935, 1.936 Environmental Lab (U.O.)	4
1.907 Environmental Statistics	2
1.954 Stream Sanitation	2
1.913 Ind. Waste Disposal	2
1.994 Environmental Eng. Seminar (Trainees Only)	2
Additional Electives	4 or 8

Environmental Health Engineering & Science	Credits
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1.985 Environmental Protection	2
1.980 Environmental Planning and Management	2
1.940 Public Health Survey	2
1.950 Air Pollution	2
1.952 Ind. Hygiene	2
1.955 Air Sampling Analysis	2
Additional Electives	8 or 12

Water Resources Engineering	Credits
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1.907 Env. Stat.	2
1.908, 1.909 Hydrology I, II	4
1.960, 1.961, 1.962 Hydr. Structures	6
1.901, 1.902, 1.903 Hydraulics	6
Additional Electives	2

Air Pollution Engineering	Credits
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1.800 Systems Analysis I	4
1.950 Air Pollution	2
1.955 Air Sampling & Analysis	2
1.957 Air Science	2
Additional Electives	6 or 10

Civil Engineering (Geotechnical)

At the master's degree level it is possible to undertake concentrated

study in geotechnical engineering which is concerned with materials within the earth's crust. Students with this interest should consider the following courses recommended by the Civil Engineering Department to obtain a competent knowledge in the field.

Courses	Credits
1.871 Soil Mechanics I	2
1.872 Soil Mechanics II	2
1.873 Engineering Properties of Soils	2
1.886 Soil Dynamics I	2
1.887 Soil Dynamics II	2
1.850 Seismic Design I	2
1.851 Selective topics - Seismic Design II	2
1.882 Engineering Geol.	2
1.884 Rock Mechanics I	2
1.885 Rock Mechanics II	2

THE DOCTOR'S DEGREE

Environmental Engineering Full-Time Program

The following material outlines the procedures for admission to the doctoral program in environmental engineering and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Ph.D. Committee, Department of Civil Engineering.

Admission

Each student admitted to the program will initially have the status of doctoral student. In the usual case, he will have received a master's degree in an appropriate field of engineering or science prior to entry into the program. Applicants should apply to the Chairman of the Ph.D. Committee, Department of Civil Engineering for admission to the doctoral program, preferably by February 1st. The committee will interview the applicant, examine his record, and decide whether he should be admitted to the program. The chairman of the department will appoint a program adviser for each doctoral student, upon the recommendation of the Ph.D. Committee.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work after admission as a doctoral student. However, it is expected that at least two years of full-time graduate study will be required beyond the master's degree.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations. At least one year of full-time study and successful completion of the qualifying examination are required for consideration as a doctoral degree candidate.

Qualifying Examination

The qualifying examination will consist of a written and an oral section. The written part will cover: (1) environmental engineering and/or science and (2) selected areas depending upon the educational background and interest of the student. In certain cases the student may be exempted from the written part of the examination. The oral portion will measure general comprehension. If the oral examination is failed, it may be repeated with permission of the departmental graduate committee. The qualifying examination shall be completed no later than two years after admittance as a doctoral student. After successful completion of this examination the student will be given the status of doctoral candidate.

Comprehensive Examination

The comprehensive examination is given after the thesis has been completed. This examination is based upon the defense of the thesis.

Course Requirements

Course requirements for each applicant will be determined by the Ph.D. Committee. Formal course work will be selected to meet the individual student's objectives. Graduate level study up to 12 quarter hours of course work, completed under programs other than this full-time program may be accepted, but requires approval of the committee.

Thesis

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes material suitable for publication.

A thesis committee will be appointed by the chairman of the Ph.D. Committee. The thesis committee, consisting ordinarily of five members, two of whom are from other departments, will be informed of the progress of the thesis and will be responsible for its approval.

Language Requirement

A reading knowledge of one foreign language is required. The requirement shall be determined in a manner prescribed by the committee, and must be satisfied prior to taking the oral qualifying examination.

mechanical engineering

The Department of Mechanical Engineering offers the degrees of Master of Science in Mechanical Engineering, Mechanical Engineer, and Doctor of Philosophy. The Master of Science degree can be pursued on either a full-time or a part-time basis. A full-time student may apply for participation in the Cooperative Plan. The Mechanical Engineer and Doctor of Philosophy degrees are pursued on a basis consistent with the residence requirements for the degree. The curriculum offers areas of concentration in Mechanics, Thermofluid Engineering, and Materials Science and Engineering.

THE MASTER OF SCIENCE DEGREE

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Mechanical Engineering, applicants must have obtained from a recognized college or university the degree of Bachelor of Science in Mechanical Engineering, or a closely-allied engineering field, with an acceptable quality of undergraduate work. Applicants with a Bachelor of Science degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

Area of Concentration

Each student must complete the required courses in one area of concentration to be eligible to receive the degree. It is expected that these courses will be completed as early as possible in his academic program. The elective courses in each area of concentration should be chosen with the aid of the student's adviser.

Required Courses

Mechanics		Credits
2.826	Math. Methods for Mech. Eng. I	2
2.827	Math. Methods for Mech. Eng. II	2
2.804	Theory of Elasticity	2
	and	
2.805	Theory of Elasticity	2
	or	
2.819	Fluid Dynamics I	2
	and	
2.820	Fluid Dynamics II	2

2.841	Vibration Theory	2
	and	
2.842	Vibration Theory	2
	or	
2.849	Automatic Cont. Eng.	2
	and	
2.850	Automatic Cont. Eng.	2
	and	
2.851	Automatic Cont. Eng.	2
		<u>12 or 14</u>

Thermofluid Engineering		Credits
2.826	Math. Methods for Mech. Eng. I	2
2.827	Math. Methods for Mech. Eng. II	2
2.819	Fluid Dynamics I	2
2.820	Fluid Dynamics II	2
2.901	Adv. Thermodynamics	2
2.902	Adv. Thermodynamics	2
2.910	Conduction Heat Trans.	2
2.911	Convection Heat Trans.	2
		<u>16</u>

Materials Science and Engineering		Credits
2.826	Math. Methods for Mech. Eng. I	2
2.827	Math. Methods for Mech. Eng. II	2
2.954	Adv. Physical Met. I	2
2.956	Adv. Physical Met. II	2
2.970	Mat. Sci. and Eng.	2
2.971	Mat. Sci. and Eng.	2
2.804	Theory of Elasticity	2
	or	
2.960	Thermo. of Materials	2
	and	
2.961	Thermo. of Materials	2
		<u>14 or 16</u>

In addition, Seminar (2.990 and 2.998) and Thesis (2.991) are required for continuous full-time and Cooperative Plan students in all areas of concentration.

Electives

Students must take sufficient mechanical engineering departmental electives so that the required courses in their major area and the departmental electives total at least 30 of the 40 quarter hours required for the degree.

The remaining ten credits may be elected from any courses in engineering or science for which the student has the necessary preparation.

Full-Time Program on the Cooperative Plan

The full-time program may be taken on the Cooperative Plan, where students enroll for academic work in the Fall and Winter Quarters of the first year and in the Fall and Winter Quarters of the second year. The other quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a Master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for the degree.

A thesis of ten quarter hours of credit is required.

For each of the areas of concentration, the sequence of courses on the Cooperative Plan are taken according to the following programs:

Mechanics

First Academic Quarter Credits

2.826	Math. Methods for Mech. Eng. I	2
2.804	Theory of Elast.	2
	or	
2.819	Fluid Dynamics I	2
2.841	Vibration Theory	2
	or	
2.849	Automatic Cont. Eng.	2
	Electives	<u>4</u>
		10

Second Academic Quarter Credits

2.827	Math. Methods for Mech. Eng. II	2
2.805	Theory of Elast.	2
	or	
2.820	Fluid Dynamics II	2
2.842	Vibration Theory	2
	or	
2.850	Automatic Cont. Eng.	2
	Electives	<u>4</u>
		10

Third Academic Quarter Credits

2.990	Seminar	1
2.991	Thesis	5
	Electives	<u>4</u>
		10

Fourth Academic Quarter		Credits
2.998	Seminar	1
2.991	Thesis	5
	Electives	<u>4</u>
		10

Thermofluid Engineering

First Academic Quarter		Credits
2.819	Fluid Dynamics I	2
2.826	Math. Methods for Mech. Eng. I	2
2.901	Advanced Thermodynamics	2
2.910	Conduction Heat Transfer	2
	Elective	<u>2</u>
		10

Second Academic Quarter		Credits
2.820	Fluid Dynamics II	2
2.827	Math. Methods for Mech. Eng. II	2
2.902	Advanced Thermodynamics	2
2.911	Convection Heat Transfer	2
	Elective	<u>2</u>
		10

Third Academic Quarter		Credits
2.990	Seminar I	1
2.991	Thesis	5
	Electives	<u>4</u>
		10

Fourth Academic Quarter		Credits
2.998	Seminar II	1
2.991	Thesis	5
	Electives	<u>4</u>
		10

MATERIALS SCIENCE AND ENGINEERING

First Academic Quarter		Credits
2.804	Theory of Elast. or	2
2.960	Thermodynamics of Materials	2

2.970	Material Science & Engineering	2
	or	
2.954	Advanced Physical Metallurgy I	2
2.826	Math. Methods for Mech. Eng. I	2
	Electives	<u>4</u>
		10

Second Academic Quarter Credits

	Elective	2
	or	
2.961	Thermodynamics of Materials	2
2.971	Material Science & Engineering	2
	or	
2.956	Advanced Physical Metallurgy II	2
2.827	Math. Methods for Mech. Eng. II	2
	Electives	<u>4</u>
		10

Third Academic Quarter Credits

2.954	Advanced Physical Metallurgy I	2
	or	
2.970	Material Science & Engineering	2
2.990	Seminar	1
2.991	Thesis	5
	Elective	<u>2</u>
		10

Fourth Academic Quarter Credits

2.956	Advanced Physical Metallurgy II	2
	or	
2.971	Material Science & Engineering	2
2.998	Seminar	1
2.991	Thesis	5
	Elective	<u>2</u>
		10

Continuous Full-Time Program

Students may take the 40 quarter hours of academic work on a continuous full-time basis and complete the degree requirements in one academic year. The sequence of courses which students take on this plan is established by their adviser.

Part-Time Program

The admission requirements for the evening part-time program are the same as for the full-time program, but students may progress according to their abilities and the time available.

Advisers for Part-Time Programs

The following faculty members in each area of concentration should be contacted if information is required relative to any academic problems.

Mechanics	Professor John N. Rossettos
Thermofluid Engineering	Professor Warren G. Nelson
Materials Science and Engineering	Professor Richard J. Murphy

THE MECHANICAL ENGINEER DEGREE

The degree of Mechanical Engineer is offered for those who wish to undertake graduate study beyond the Master's degree without committing themselves to a program as extensive as that required for the Doctor's degree. The degree permits a candidate to pursue a course of study at the upper graduate level in more than one area of Mechanical Engineering as distinguished from the specialization usually associated with the doctoral program.

The following material outlines the requirements for the Mechanical Engineer degree. For further information applicants should write to the Chairman of the Graduate Committee, Department of Mechanical Engineering, Northeastern University, Boston, Massachusetts 02115.

Admission

To be admitted to candidacy for the degree of Mechanical Engineer, the applicant will have obtained the degree of Master of Science in Mechanical Engineering, or its equivalent, from a recognized institution. In some cases, where the Master's degree is not in Mechanical Engineering, the applicant may be admitted to the program on a conditional basis with the stipulation that certain deficiencies be removed without credit toward the degree. Such special admission is dependent upon the approval of the Mechanical Engineering Graduate Committee.

In general, an applicant will choose two areas of concentration to give him the broad background which characterizes the degree of Mechanical Engineer. An outline of his program must be submitted to the Graduate Committee for approval before final action can be taken upon his application. It is recommended that the applicant discuss his program with the Graduate Committee and members of the graduate faculty in his areas of concentration prior to submission of his program for approval.

Each applicant must submit to the Graduate Committee prior to March 1: (1) transcripts of his undergraduate and graduate records, (2) three letters of recommendation which indicate his ability to carry out advanced graduate work, and (3) the program of study which he proposes to follow.

Classification and Degree Candidacy

A student admitted to the Mechanical Engineer degree program will be designated as a Candidate for this degree. The Candidate's adviser normally will be the faculty member who will supervise the dissertation.

Residence Requirement

The residence requirement is satisfied by two academic quarters of full-time graduate work during the academic year or by four academic quarters of half-time graduate work during two consecutive academic years. Plans for satisfying the residence requirement on a half-time basis must be approved by the Graduate Committee.

Qualification and Examinations

A student must maintain a B average to qualify for the degree. Students admitted on a conditional basis may be required to pass special examinations. The Graduate Committee will determine the need for and will administer any such special examinations. A final oral examination consisting of a defense of the dissertation may be required if the Candidate's adviser and the Departmental Graduate Committee so decide.

Credit Requirements

A minimum of 40 quarter hours of credit beyond the Master's degree is required. Up to 10 quarter hours of credit will be permitted for work on a dissertation. A minimum of 20 quarter hours of credit must be in the Mechanical Engineering Department.

Dissertation

To be awarded the Mechanical Engineer degree, each candidate must complete a dissertation demonstrating a high level of competence in research, development, or design in the field of Mechanical Engineering. The effort normally expected will be the equivalent of 10 quarter hours of graduate course work.

Transfer Credits

Any transfer of credits must be approved by the Mechanical Engineering Graduate Committee.

Time Limitation

After admission to the program, a maximum of five years will be permitted for completion.

Registration

After approval of the Candidate's program, registration must be continuous. Withdrawal or changes in the program must be approved by the Graduate Committee.

THE DOCTOR OF PHILOSOPHY DEGREE

The degree of Doctor of Philosophy is awarded to those candidates who demonstrate high attainment and research ability in the field of Mechanical Engineering.

The following material outlines the requirements for the Doctor of Philosophy degree. For further information applicants should write to the Chairman of the Department of Mechanical Engineering, Northeastern University, Boston, Massachusetts 02115

Admission

The program leading to the Ph.D. degree is open to persons who are candidates for the Master of Science in Mechanical Engineering degree as well as those who have received the degree. Requests for admission to the program should be made to the Chairman of the Department of Mechanical Engineering. Applicants will receive an application for interview form. This form, along with transcripts of all undergraduate and graduate work and three letters of recommendation, must be returned to the Chairman of the Graduate Committee of the Department of Mechanical Engineering by November 1. The applicant will be notified of an interview time. Based upon an evaluation of the applicant's qualifications, the Graduate Committee will inform the applicant whether or not he will be admitted to the program.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or by two years of half-time graduate work beyond the Master's degree. However, a student should expect to spend at least two years, or the equivalent, in full-time graduate study beyond the requirements of the Master's degree.

Degree Candidacy

After 40 quarter hours of graduate work have been taken with satisfactory grades and upon successful completion of the qualifying examination, a student is established as a degree Candidate.

Qualifying Examination

The qualifying examination in the Department of Mechanical Engineering is offered yearly in January and is both written and oral. The written portion of the qualifying examination is six hours in length and covers, with equal emphasis, four different areas. A student must select one area from each of the three groups A, B, and C, plus another area either listed below or unlisted, but considered equivalent and approved by the Graduate Committee.

A. Concepts of Thermodynamics

Applied Thermodynamics

B. Dynamics

Mechanics of Deformable Bodies

C. Heat and Mass Transfer

Fluid Mechanics

Mechanical Behavior of Materials

Physical Metallurgy

The oral portion of the qualifying examination is conducted by a committee consisting of at least four members appointed by the Graduate Committee. A typical committee is composed of two members specializing in the student's major area plus one member from each of two other areas.

The qualifying examination may be taken by a graduate student who expects to complete the requirements for his Master's degree within three months of the date of the qualifying examination as well as by a person who has already completed the requirements for the Master's degree. Because degree candidacy must be established before the Graduate Committee will act to approve course programs or dissertation proposals, the qualifying examination should be taken at the earliest opportunity. If the examination is failed, it may be repeated with permission of the departmental Graduate Committee.

Course Requirements

To receive the Ph.D. degree a candidate must complete a program of course work approved by the Graduate Committee. Courses completed prior to admittance to the doctoral program are subject to the approval of the Graduate Committee. Each program must contain at least twelve quarter hours of course work, preferably outside of the department, in an area other than that in which the candidate is concentrating. Attainment of a B average for the courses in the "minor" portion of the program will signify satisfactory completion of that portion.

Dissertation

After degree candidacy has been established, a candidate must complete a dissertation which embodies the results of extended research and includes materials suitable for publication.

The departmental Graduate Committee may require the completion of certain course work before permitting dissertation work to commence. A Dissertation Committee will be appointed by the Chairman of the department upon the recommendation of the departmental Graduate Committee. The Dissertation Committee will be kept informed of the work and will be responsible for initial approval of the dissertation in its final form.

Language Requirement

A reading knowledge of one foreign language is required. Proficiency in a language shall be determined in a manner prescribed by the departmental Graduate Committee. The language requirement must be fulfilled within six months after the dissertation proposal has been accepted but no less than six months before the degree is granted.

Comprehensive Examination

The comprehensive examination is combined with the final oral examination and is given after the dissertation has been completed and approved. This examination is based upon the subject matter of the dissertation and a defense of it.

Final Oral Examination

The final oral examination is taken after completion of all other requirements for the degree. This examination cannot be held until two weeks have elapsed after the dissertation has been registered and accepted by the Graduate School and must be passed at least two weeks before the commencement at which the degree is to be awarded.

The final oral examination will include the subject matter of the doctoral dissertation and significant developments in the field of the dissertation work. Other fields may be included if recommended by the examining committee.

electrical engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Electrical Engineering, applicants must have obtained a Bachelor of Science degree in Electrical Engineering, with an acceptable quality of undergraduate work, from a recognized college or university. Applicants with a Bachelor of Science degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification. In some cases, students whose Bachelor of Science degree is in some other engineering or related science field may qualify for the degree of Master of Science in Electrical Engineering. This requires special approval of the Department of Electrical Engineering.

THE MASTER'S DEGREE

Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan. On this Plan the student takes academic work during the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. The remaining quarters (including the Summer Quarter between the first and second year) are available for professional employment.

The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

Fall Quarter		Credits
3.823	Mathematic Methods in Electrical Engineering	4
3.827	Linear Systems Analysis	4
3.990	Seminar I	2
	Electives	<u>4 or 6</u>
		14 or 16

Spring Quarter		Credits
3.832	Network Synthesis	4
3.877	Electromagnetic Theory	4
3.991	Seminar II	2
	Electives	<u>4 or 6</u>
		14 or 16

Winter Quarter**Credits**

3.842	Linear Active Circuits	4
3.902	Applied Prob. & Stoch. Processing	4
3.990	Seminar I	2
	Electives	<u>4 or 6</u>
		14 or 16

A limited amount of work may be elected from the part-time program.

A thesis for six quarter hours credit is elective with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second year of the program. Details concerning thesis proposals, editorial format, and time schedules are available in the Graduate School Office.

The program of each student will be made up from the required and elective courses available in each term and approved by the student's academic adviser.

Electives

The electives will normally be available according to the following schedule:

Fall Quarter

- 3.902 Applied Probability and Stochastic Processes
- 3.959 Control Theory I — Analysis and Synthesis
- 3.979 Electronic Digital Computers
- 3.8T0 Numerical Methods and Computer Applications

Winter Quarter

- 3.902 Applied Probability and Stochastic Processes
- 3.962 Control Theory II — Nonlinear and Sampled-Data Systems
- 3.966 Switching Circuits

Spring Quarter

- 3.8T9 Digital Filtering
- 3.905 Information Theory and Coding
- 3.954 Systems Analysis
- 3.965 Control Theory III — Optimal Control and Stochastic Systems

(Additional electives will be available from the late afternoon portion of the part-time program in all quarters.)

Full-Time Program

For those students whose programs would be better served by full-time study the prescribed courses may be taken in one academic year. The se-

quence of the required courses will be different from the full-time program on the Cooperative Plan.

POWER SYSTEMS MAJOR

Full-Time Program on the Cooperative Plan

The course requirements vary with the student's background, but generally can be computed on the basis of the minimum of 40 quarter hours of course work.

For students enrolled in Northeastern's Power Systems Program at the undergraduate level, it is possible (and customary) to take 6 q.h. of credit toward the M.S. in the last quarter of their senior year. Normally these courses are 3.900 Applied Probability and Stochastic Processes A, 2 q.h. and 2.237 Nuclear Engineering II, 4 q.h. although other options (e.g. 3.959 Control Systems I, 3.295 Numerical Methods and Computer Applications) are acceptable. This permits a student to accept a co-op assignment during the summer and fall and then to complete the M.S. requirements with full-time study during the Winter and Spring Quarters. Such a student would take the following program.

Winter Quarter	Credits
3.827 Linear Systems Analysis	4
3.926 Power Circuit Analysis II	2
3.936 Computers in Power Systems II	2
3.941 Electric Machinery Theory II	2
*3.292 Mathematical Techniques in Electrical Engineering I	4
Electives	<u>2-4</u>
	16-18

Spring Quarter	Credits
3.877 Electromagnetic Theory	4
3.927 Power Circuit Analysis III	2
3.937 Computers in Power Systems III	2
3.931 Power System Planning	4
Electives	<u>4-6</u>
	16-18

Total Must Equal 34 Credits

Students coming from other institutions, who wish to enroll in the Co-operative Plan will attend classes during the Fall and Winter of his first year, go out on a cooperative work assignment for the Spring and Summer, and return to finish their studies in the Fall of their second year. A specimen program follows.

* An acceptable alternative to 3.292 is the equivalent 3.8C1 and 3.8C2 offered in the evening.

Fall Quarter	Credits
3.827 Linear Systems Analysis	4
3.925 Power Systems Analyses I	2
3.935 Computers in Power Systems I	2
3.875 Electromagnetic Field Theory I	2
3.940 Electric Machinery Theory I	2

Winter Quarter	Credits
3.926 Power Systems Analysis II	2
3.876 Electromagnetic Field Theory II	2
3.936 Computers in Power Systems II	2
3.941 Elective Machine Theory II	2
3.990 Seminar	2
3.933 Power System Transients	2
Electives	4

Fall Quarter	Credits
3.932 Power System Protection	2
or	
3.945 Power System Dynamics	2
2.236 Nuclear Engineering I	4
3.959 Control Theory I	4
3.991 Seminar	2
Electives	2-4

For electives, all power students should consider selections from the power systems courses listed on page 125. Other suitable graduate courses are possible with the approval of the Director of the Power Systems Evening Program.

Continuous Full-Time Program

For those students whose plans would be better suited by continuous full-time study the prescribed courses may be taken in one academic year. The courses required in the spring quarter will be somewhat different from the specimen programs shown above.

Part-Time Program Power Systems Major

Forty quarter hours of academic work are required for the master's degree of which 26 quarter hours of credit are specified as follows:

Required Courses	Credits
3.825 Linear Systems Analysis II	2
3.826 Linear Systems Analysis III	2
3.875 Electromagnetic Theory I	2

3.876	Electromagnetic Theory II	2
3.900	Applied Probability and Stochastic Processes A	2
3.8C1	Mathematical Methods in Electrical Engineering I	2
3.8C2	Mathematical Methods in Electrical Engineering II	2
3.926	Power Circuit Analysis II	2
3.927	Power Circuit Analysis III	2
3.936	Computers in Power Systems II	2
3.937	Computers in Power Systems III	2
3.941	Electric Machinery Theory II	2
3.930	Power System Planning	2

In addition to the specified course work, each student must complete 10 of the remaining 14 quarter hours from the Power System Electives listed on page 61.

Part-Time Program Electrical Engineering

Admission

The admission requirements for the part-time program leading to the degree of Master of Science in Electrical Engineering are the same as for the full-time program, but students may progress according to their abilities and the time available.

All graduate courses presuppose mastery of the subject matter of a modern, fully accredited curriculum in electrical engineering. Applicants who have not taken further academic work for some time since they received their bachelor's degree may be required to take graduate courses to satisfy any deficiencies. For this purpose, the following courses are available:

Courses		Credits
3.975	Precis of Modern Electrical Engineering I	2
3.976	Precis of Modern Electrical Engineering II	2
3.977	Precis of Modern Electrical Engineering III	2
3.978	Precis of Modern Electrical Engineering IV	2

These courses carry graduate credit but a maximum of four quarter hours of credit from this group may be used as elective credit in the degree program.

Program

Forty quarter hours of academic work are required for the master's degree of which 16 quarter hours of credit are specified as follows:

Required Courses		Credits
3.825	Linear Systems Analysis II	2
3.826	Linear Systems Analysis III	2

3.840	Linear Active Circuits I	2
3.841	Linear Active Circuits II	2
3.875	Electromagnetic Theory I	2
3.876	Electromagnetic Theory II	2
3.8C1	Mathematical Methods in Electrical Engineering I and	2
3.8C2	Mathematical Methods in Electrical Engineering II or	2
3.8C4	Mathematical Methods in Electrical Engineering III and	2
3.8C5	Mathematical Methods in Electrical Engineering IV or	2
3.900	Applied Probability and Stochastic Processes I and	2
3.901	Applied Probability and Stochastic Processes II	2

Students lacking the necessary prerequisites for 3.8C1 or 3.8C4 may be required to take undergraduate courses 3.292 or 3.293 to clear this deficiency. By petition, these courses may carry graduate credit.

Electives

In addition to the required course work each student is expected to select a major and a minor area from the list given below. Ten quarter hours of credit must be taken in the major area and six quarter hours of credit taken in the minor area. The area or areas to which a course is assigned is indicated in the following listings. Not every course is assigned to an area. They may be used as one of the free elective courses. Eight quarter hours of credit are free electives which may be selected from graduate courses in sciences or other engineering departments for which the student has the necessary preparation.

Subject Areas

1. Circuits and Systems

3.830	3.838	3.911
3.831	3.839	3.912
3.832	3.843	3.950
3.833	3.845	3.951
3.834	3.860	3.952
3.835	3.861	3.953
3.837	3.910	3.954

2. Computer Science

3.837	3.893	3.898	3.8T1
3.860	3.894	3.899	3.8T0
3.861	3.895	3.8A1	3.8T2

3.8T3	3.937	3.973	3.988
3.8T7	3.966	3.974	3.989
3.8T8	3.967	3.979	3.9A1
3.8T9	3.968	3.985	3.9A2
3.935	3.969	3.986	3.9D1
3.936	3.972	3.987	

3. Fields, Waves and Optics

3.800	3.818	3.891	3.922
3.801	3.819	3.913	3.923
3.802	3.878	3.914	3.924
3.806	3.879	3.915	3.980
3.807	3.880	3.916	3.981
3.808	3.881	3.917	3.982
3.810	3.882	3.918	3.983
3.811	3.883	3.919	3.984
3.812	3.885	3.920	
3.817	3.890	3.921	

4. Communications and Control

3.817	3.898	3.908	3.962
3.818	3.899	3.909	3.963
3.819	3.900	3.9C1	3.964
3.865	3.901	3.9C2	3.965
3.866	3.902	3.957	3.9A1
3.867	3.903	3.958	3.9A2
3.871	3.905	3.959	
3.872	3.906	3.960	
3.873	3.907	3.961	

5. Physical Electronics

3.806	3.808	3.854	3.8G2
3.807	3.853	3.8G1	3.8G3

6. Power Systems

2.905	2.936	3.927	3.940
2.906	2.938	3.928	3.941
2.907	2.942	3.930	3.942
2.920	2.943	3.931	3.943
2.921	2.944	3.932	3.944
2.931	3.810	3.933	3.945
2.932	3.811	3.935	3.955
2.933	3.812	3.936	3.956
2.934	3.925	3.937	
2.935	3.926	3.938	

Quarter-Sequence Courses

Certain courses have an A or B after the course title. In these cases, credit will be given toward the degree only if both the A and B courses are successfully completed.

COMPUTER SCIENCE MAJOR

The Computer Science Program is structured to provide a curriculum of study in computer science and engineering leading to the degree of Master of Science in Electrical Engineering, or Master of Science, with a major in Computer Science.

Admission

To be enrolled for this degree program, applicants must have obtained a Bachelor of Science degree in engineering, mathematics, or the physical sciences from a recognized college or university and must present satisfactory evidence of ability to pursue graduate study.

Program

Forty quarter hours of academic work are required, of which 14 are specified and 26 are elective.

Specified Courses	Credits
3.893 Digital Computer Programming I	2
3.894 Digital Computer Programming II	2
3.972 Electronic Digital Computers I	2
3.973 Electronic Digital Computers II	2
3.8A1 Mathematical Methods in Computer Science	2
3.8T1 Numerical Methods and Computer Applications I	2
3.8T2 Numerical Methods and Computer Applications II	2

Electives

Sixteen quarter hours of credit must be chosen from the following list of courses. It is urged that students take both of the courses in any two-quarter sequence they elect, and at least two courses in any three-quarter sequence they elect.

- 3.837 Introduction to Graph Theory
- 3.895 Digital Computer Programming III
- 3.898 Combinatorial & Optimization Techniques I
- 3.899 Combinatorial & Optimization Techniques II
- 3.8T3 Numerical Methods and Computer Applications III
- 3.8T7 Digital Filtering I
- 3.8T8 Digital Filtering II

- 3.9A1 Error Correcting Coding I
- 3.9A2 Error Correcting Coding II
- 3.908 Special Topics in Communication Theory
- 3.966 Switching Circuits
- 3.967 Switching Circuits I
- 3.968 Switching Circuits II
- 3.969 Switching Circuits III
- 3.974 Electronic Digital Computers III
- 3.985 Fundamentals of Automatic Digital Computation I
- 3.986 Fundamentals of Automatic Digital Computation II
- 3.987 Fundamentals of Automatic Digital Computation III
- 3.988 Special Topics in Computer Science
- 3.989 Computer Peripherals
- 3.995 Thesis
- 3.998 Special Problems in Electrical Engineering
- 5.911 Linear Programming
- 5.916 Engineering Analysis Utilizing Data Processing
- 5.941 Management Information Systems

Students must take sufficient electrical engineering departmental courses to total 30 of the 40 quarter hours required for the degree.

Thesis

A thesis carrying six credits may be elected with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second half of the program.

THE DOCTOR'S DEGREE

Full-Time Program

The following material outlines the procedures for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Secretary, Department of Electrical Engineering.

Admission

Students who are interested in pursuing a doctor's program, should contact the Electrical Engineering Department to request an application. Completed applications, together with transcripts of all prior work and two letters of recommendation, should be forwarded to the Electrical Engineering Department, 412 Dana Hall, no later than December 1 of the preceding year. Following evaluation of this material, the applicant will be informed whether or not he will be permitted to undertake the qualifying examination. A personal interview is not required, but a student may arrange with the Secretary of the Electrical Engineering Graduate Committee, Professor Robert N. Martin (617-437-3041), for an appointment for further program

details if desired. A student who has received approval to take the qualifying examination is considered a pre-doctoral student until such time as he passes the examination. Upon successful completion of the qualifying examination he becomes a Ph.D. candidate.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the student's adviser in order to give evidence that at least half of the time is being devoted to the requirements of the graduate school program.

Qualifying Examination

The Ph.D. qualifying examination has emerged from its role as a requirement for admission to the doctoral program to the dual purpose of, one: serving as an indicator of the student's capability for successful completion of the program, and two: serving as a guide to his adviser in developing a suitable plan of study tailored to the individual needs of the candidate.

With these goals in mind, the candidate is urged to take the qualifying examination early in his graduate program (i.e., not later than the successful completion of 40 quarter hours of graduate work).

The examination is composed of a written and an oral part, and is usually given in the Spring Quarter of each academic year. The written part covers the following general categories:

- (1) Circuits and Electronics
- (2) Fields, Waves, and Energy Conversion
- (3) Systems
- (4) Miscellaneous Topics in Electrical Engineering

For candidates pursuing a Ph.D. with an emphasis in either Computer Science or Modern Optics, the qualifying examination will be appropriately modified.

The oral part is designed to test general comprehension. Together, the oral and written portions of the examination review the factual knowledge of a typical undergraduate Electrical Engineering program and the understanding of that material from a more mature point of view.

If the examination is failed it may be repeated only with permission of the Graduate Committee upon recommendation of the Ph.D. Qualifying Examination Committee.

Comprehensive Examination

Within three years of his establishment of degree candidacy, the student will be required to demonstrate by means of a comprehensive examination a subject matter knowledge satisfactory for the award of the degree.

The comprehensive examination is an oral examination open to the Electrical Engineering faculty (assistant professor and above in rank) and ad-

ministered by the student's Thesis Committee. Departmental faculty will be informed of the examination via a departmental notice at least one week prior to the examination. Normally the examination will be given at the time the Thesis Proposal is submitted to the Thesis Committee for approval. As part of this examination the Thesis Committee will review the student's doctoral program and his performance in graduate courses, as well as examine the student on subject matter related to his graduate studies and his thesis area.

Course Requirements

Successful completion of a doctoral program normally requires 70 quarter hours of satisfactory graduate level work exclusive of thesis research and doctoral reading courses.

Doctoral Seminar, 3.993 and 3.994 are the only required courses.

The course work must include a three-course sequence (graduate level) in each of two minor areas. Both minors must be in science, applied science, or a related area. One minor may be chosen from an area of electrical engineering outside the candidate's proposed major area.

Thesis

The candidate's thesis research shall be directed by his Thesis Adviser, whom he shall select upon establishing candidacy. The Thesis Committee shall approve the thesis in final form.

Language Requirement

The language requirement may be satisfied in French, German, or Russian, with an additional option of English for Ph.D. candidates for whom English is not the native language. The Princeton Educational Testing Service Language Examinations are used. Information on these exams may be obtained from the Department Office, 411 Dana.

Final Oral Examination

This examination will be held in accordance with the departmental regulations.

THE ELECTRICAL ENGINEER DEGREE

The Department of Electrical Engineering offers the graduate professional degree usually known as the Engineer Degree. This degree, offered at a number of institutions, usually requires about one year of full-time graduate study beyond the master's degree. The official title of the degree is "Electrical Engineer".

The following material outlines the procedures for admission to the Electrical Engineer degree program and the steps necessary to qualify for the degree. For further information applicants should write to the Department of Electrical Engineering.

Admission

A master's degree in engineering or a related field with a better than B average and the approval of the departmental graduate committee is required for admission. In some cases, where the master's degree is not in Electrical Engineering, a student may be admitted to the program with the stipulation that certain preparation be completed without credit toward the degree.

Applicants must obtain an interview with a faculty member (who will usually become the student's adviser by appointment of the graduate committee). The applicant must complete the following documentation:

1. An application form (apply to the E.E. Dept. office)
2. Two letters of recommendation
3. Transcripts of all college-level work
4. A written statement setting forth the student's educational and career goals

The E.E. Graduate Committee considers applicants for the Engineer's Degree program at their first meeting held in the Fall and Spring Quarter. The student's application is reviewed and presented to the Graduate Committee by the co-ordinator of the E.E. Program.

The Engineer Degree is available on either a full- or a part-time basis.

Classification and Degree Candidacy

A student admitted to the Engineer Degree program will be designated as a candidate for this degree.

Residence Requirement

The residence requirement is satisfied by two academic quarters of full-time graduate work during the same academic year or part-time graduate work during a period of two consecutive academic years subject to approval of adviser.

Qualification and Examinations

A student must maintain a B average and receive no F's in order to qualify for the degree. In some instances, a student may be required to take special examinations. Such examinations will be determined in each case by the departmental graduate committee.

Course Requirements

The minimum course requirements are 40 quarter hours beyond the master's degree. No more than 10 out of the 40 quarter hours of credit are allowed for thesis and special problems combined. A minimum of 20 quarter hours must be taken in regularly scheduled electrical engineering subjects. The student's course program must be approved by the adviser.

Dissertation

Each engineer degree student must complete a dissertation which demonstrates a high level of competence in research, development, or design in the field of electrical engineering. Thesis registration must total at least 6 quarter hours of graduate work. In no case will more than 10 quarter hours be credited towards the degree requirements.

In some cases a master's thesis of superior quality may be used to satisfy the thesis requirement. The thesis supervisor has responsibility for acceptance of the thesis.

Prior to submission of the thesis for acceptance the student must make a thesis presentation to be arranged by the adviser, who will provide reasonable notice to all Electrical Engineering faculty and others who may be interested. The thesis supervisor has responsibility for acceptance of the thesis.

Language Requirement

No foreign language is required for the Electrical Engineer degree.

Final Oral Information

A final oral examination consisting of a defense of the dissertation may be required if the student's adviser or the departmental graduate committee so decide.

Transfer of Credits

Approval for transfer of credit may be given by the departmental graduate committee upon written request from the student. Such requests should be submitted at the time of application to the program. A maximum of 10 quarter hours of credits may be transferred from another school but transfer credits for thesis are not allowed.

Time Limitation

After admission to the program, a maximum of three years will be allowed for completion of the degree requirements. Extension of this time limit may be granted by the departmental graduate committee.

Registration

All students must register for course work or dissertation as approved by their adviser or the departmental registration officer. After initial registration, registration must be continuous unless withdrawal is allowed by the departmental graduate committee.

chemical engineering

Admission

To be enrolled for graduate work in Chemical Engineering, applicants usually have obtained a Bachelor of Science degree in Chemical Engineering, with an acceptable quality of undergraduate work from a recognized college or university. However, qualified students with other B.S. or B.A. degrees in science or engineering may be admitted. Such students are required to complete supplementary undergraduate work in addition to the usual M.S. program in order to qualify for the M.S. degree in Chemical Engineering. Complete programs for these students are worked out after the student has made formal application to the program through the Graduate School of Engineering. The undergraduate work required is strongly dependent on the mathematics, chemistry, and engineering background of the applicant. The undergraduate course work in such programs may not be used for degree credit.

THE MASTER'S DEGREE

Full-Time Program on The Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan where students enroll for academic work in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

First Academic Quarter		Credits
4.802	Chemical Engineering Electives	8
	Electives	4
4.991	Thesis	<u>2</u>
		14
Second Academic Quarter		Credits
	Chemical Engineering Electives	8
4.991	Thesis	<u>5</u>
		13

Third Academic Quarter**Credits**

	Chemical Engineering Electives	8
4.991	Thesis	<u>5</u>
		13

Chemical Engineering Electives

At least two Chemical Engineering electives will be scheduled each academic quarter. Consult the course SCHEDULE bulletin of the Graduate School of Engineering for the offerings in the current academic year. Possible offerings are:

Fall Quarter:

- 4.802 Chemical Engineering Mathematics
- 4.829 Chemical Process Control
- 4.870 Polymer Science

Winter Quarter

- 4.801 Advanced Chemical Engineering Calculations
- 4.803 Numerical Techniques in Chemical Engineering
- 4.811 Chemical Engineering Thermodynamics
- 4.823 Transport Phenomena
- 4.840 Advanced Management Techniques in the Chemical Industry
- 4.978 Separation Processes
- 4.890 Chemical Reactor Analysis
- 4.974 Fluid Mechanics

Spring Quarter

- 4.806 Optimization Techniques
- 4.837 Modeling and Simulation of Chemical Processes
- 4.845 Advanced Plant Design Concepts
- 4.850 Chemical Process Pollution Control (Water)
- 4.973 Heat Transfer
- 4.891 Kinetics of Chemical Processes

Credit and Course Requirements

The Master of Science degree in Chemical Engineering is awarded to students who have satisfactorily completed an approved program of forty quarter hours of correlated work of graduate caliber. A minimum of thirty quarter hours of credit must come from graduate course offerings in Chemical Engineering. At least five of the Chemical Engineering courses must carry four quarter hours of credit. All four quarter hour courses offered by the department except those involving individual (project-type) work are acceptable in meeting this requirement. Research Techniques I and II (4.833 and 4.834) and/or M.S. Thesis (4.991) are required only for students who wish to pursue the department's doctoral programs. However, these courses may be taken by other students when their career objectives deem them advisable. Courses taken outside the department which are to be used for degree credit must be approved in advance by the department's graduate adviser.

PART-TIME PROGRAM

The admission requirements for this program are the same as for the full-time program, but students may progress according to their ability to combine their study with their employment. The credit and course requirements for this program are the same as for the full-time cooperative program. The department will offer two 4 quarter hour graduate courses in the late afternoon time period to assist part-time students in meeting degree requirements. A maximum of seven years is allowed for completion of this program.

Students wishing to switch their status from part-time to full-time M.S. candidates must notify the Chemical Engineering Department and make formal application with the Graduate School of Engineering. Such requests are usually granted for the full-time program to begin in the Fall Quarter.

THE DOCTOR OF PHILOSOPHY DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Chemical Engineering.

Admission

Applicants who are enrolled as candidates for the degree of Master of Science in Chemical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Chemical Engineering for admission to the doctoral program. Such application must be made by April first of the year in which they expect to receive the master's degree. The departmental graduate committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the master's degree should write the chairman of the department for an application for an interview. This form, together with transcripts of all undergraduate and graduate work, must be transmitted to the chairman of the departmental graduate committee. The applicant will be notified of an interview time and, after the interview, will be advised if he should make formal application for admission to the doctoral program. Approved applicants must submit an application for admission as a doctoral candidate and two letters of recommendation not later than April first. The applicant will be notified of the acceptance of his application and the date of the qualifying examination.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the departmental

graduate committee as evidence that at least half of the time is being devoted to the requirements of the graduate school program. In general, it should be expected that at least two years of full-time work after establishment of degree candidacy will be necessary.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

The qualifying examination includes both written and oral parts and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take a written examination in each area each time they are given; and may repeat a failed examination, only once, at a later offering. Successful completion of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

Comprehensive Examination

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

Course Requirements

The course requirements in addition to the minimum requirements for establishing degree candidacy will be determined by the departmental graduate committee and the student in consultation with the committee.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general graduate school regulations.

Thesis

An individual may choose his thesis topic and supervisor as soon as he becomes a doctoral student. In most cases selection of topic will be made immediately after the student has established his candidacy for the Ph.D. degree. He will be expected to discuss with the staff their Ph.D. thesis topics offerings. After these discussions, the student shall notify the adviser, the

department head, and the chairman of the departmental graduate committee in writing of his choice of thesis topic and adviser. The chairman of the departmental graduate committee after consultation with the thesis adviser shall appoint an appropriate thesis committee. This committee shall be kept informed of the progress of the thesis and will approve the thesis in its final form.

Language Requirement

The foreign language requirement may be satisfied by a reading knowledge in two languages selected from French, German, and Russian. The examinations are administered by the department and consist of translation from current scientific journals or textbooks.

Final Oral Examination

This examination is held in accordance with the general regulations of the graduate school.

THE DOCTOR OF ENGINEERING DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Doctor of Engineering degree. For further information, applicants should write to the Chairman of the Department of Chemical Engineering.

Admission

Applicants for the Doctor of Engineering program must either be candidates for the Master of Science degree in Chemical Engineering or have completed the Master of Science program in Chemical Engineering.

Applicants need not have undertaken a master's thesis.

Applicants for the Doctor of Engineering degree must pass the doctorate qualifying examination given to applicants for the Doctor of Philosophy degree in this department.

Applicants must file application forms with the departmental graduate committee along with official transcripts of previous college work, and two letters of recommendation. Applicants will not be considered until all documents have been received. Applicants will be notified promptly as to whether or not they have been accepted.

Residence Requirement

The residence requirement is satisfied only by full-time residence for one academic year. This requirement must be fulfilled after successful completion of the qualifying examination and prior to the end of the five-year period set forth in the general regulations.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

The qualifying examination includes both written and oral parts and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take any or all of the examinations in each area and may repeat a failed examination, only once, at a later offering. The taking and successful completion of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

Comprehensive Examination

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

Course Requirements

The course requirements, in addition to the minimum requirements for establishing degree candidacy, will be determined by the departmental graduate committee and the student in consultation with the committee.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general graduate school regulations.

Engineering Problem

Engineering Problem advisers will be appointed by the departmental graduate committee. Approval of the topic for the Problem rests with the Problem adviser and the committee.

The Engineering Problem is not a research problem but rather an engineering problem in depth. It may include elements of design, economics, business management principles, and process development. In general, it will not include laboratory investigations.

Normally, the Engineering Problem will be solved on campus. Under special arrangements approved by the departmental graduate committee

and the adviser, a portion of the work may be performed off campus.

Regardless of the arrangements made for the Engineering Problem, no off-campus adviser will be approved. Only the Problem adviser will specify the nature and requirements of the Problem, and the findings and results remain the property of the adviser and the University to be published as they determine.

Language Requirement

There is no foreign language requirement for this degree.

Computer Ability

Ability with computer programming must be demonstrated when required.

Final Oral Examination

This examination is held in accordance with the general graduate school regulations.



industrial engineering and engineering management

The Department of Industrial Engineering offers the following degrees:

Master of Science in Industrial Engineering

Master of Science in Engineering Management

Industrial Engineer

Students pursuing a Master of Science degree may choose one of the following areas of concentration:

General Program

Assurance Sciences

Computer and Information Systems

Health Systems

Human Factors

Operations Research

The above programs may be taken by full-time students on a continuous basis or under the co-operative or sponsorship (intern) plans as described under the "Regulations of the Graduate School of Engineering." Students pursuing the Master of Science on a part-time basis may undertake the Engineering Management programs or may take one of the Industrial Engineering concentrations with approval by the academic adviser.

Admission

To be enrolled for graduate study leading to the degree of Master of Science in Industrial Engineering or Engineering Management, the applicant must have obtained a Bachelor of Science degree in an engineering field, with an acceptable quality of undergraduate work from a recognized college or university. A limited number of applicants with a Bachelor of Science degree in mathematics or a closely related science, whose preparation is considered adequate, may be permitted to pursue either program, and, upon its completion, qualify for the degree of Master of Science without specification.

To be accepted for candidacy for the degree of Industrial Engineer, the applicant must possess the master's degree in Industrial Engineering or equivalent from a recognized institution. Further, an applicant for candidacy must have the potential capability to structure and solve complex real-world

problems. Evidence of this capability may be in the form of a thesis completed as a requirement for the Master of Science Degree, or in such other form as is acceptable to the Industrial Engineering Department Graduate Committee.

Prerequisite Courses

Entrance to any of the above programs presupposes that the student has had a basic course in each of the following areas: engineering economy, probability, engineering statistics, operations research (deterministic and stochastic), computer programming (compiler language), and accounting. Recognizing that some applicants may not have taken certain of these subjects, the program offers the intensive courses listed below. At the time of admission to the program, the adviser will specify those courses on the list which the applicant must complete satisfactorily to qualify for the degree. Such specified courses are to be completed as early in the program as scheduling will permit. The courses below carry graduate credit up to a maximum of six quarter hours of elective credit toward the degree.

Course	Credits
5.808 Basic Engineering Economy	2
5.810 Industrial Accounting for Engineers	2
5.900, 5.901,	
5.902 Operations Research	4
5.913 Data Processing for Engineers (FORTRAN)	2
*5.960 Probability I	2
*5.961 Probability II	2
*5.962 Statistics I	2
	<hr/> 16

*(Note: As of September 1976, these courses supercede 5.950 and 5.951, Statistics I and II. Students enrolled in the program prior to this date who have not satisfied a requirement of 5.950 and 5.951 should see their adviser to work out equivalent courses and credits.)

General Requirements for the Master of Science Degree

A minimum of 40 quarter hours of graduate level credit is required for any of the Master of Science programs in the Industrial Engineering Department including not more than six quarter hours of "Prerequisite Courses".

The required courses for each of the general and major area programs are listed in the following pages. The remaining hours to complete each program may be considered as free electives, unless otherwise stated. These may be any graduate courses offered within the College of Engineering or the Department of Mathematics for which the student has adequate preparation. Up to six quarter hours may be elected in other graduate schools with the approval of the student's faculty adviser and of the director

of the graduate school offering the desired course. Students should consult the catalogs of the Graduate Schools of Business Administration, Arts and Sciences, or other programs. The amount of credit applied toward the degree will be established by the student's adviser.

Master of Science in Industrial Engineering

General Program

The general program in Industrial Engineering is designed to provide an opportunity for the engineer to study contemporary industrial engineering techniques as practiced in manufacturing or service industries, or government agencies. Courses are designed to provide an environment whereby students may work with faculty members in their areas of expertise, structuring the courses in a way that enrichment in a particular specialty area can be achieved.

Students with an undergraduate degree in Industrial Engineering will have the opportunity of gaining additional expertise in the field. The engineer with a degree in another discipline can develop industrial engineering techniques, building upon his or her other particular background.

All students in the general program will take the required courses shown below. Equivalent substitutions must have Department approval.

Course	Credits
5.803 Industrial Organizations	2
5.823 Advanced Production Analysis (or equivalent)	4
5.824 Case Studies in Industrial Engineering (or equivalent)	2
5.909 Systems Engineering and Analysis	2
5.914 Advanced Operations Research	4
5.963 Statistics	2
5.964 Design of Experiments I	2
5.992 Seminar	2
5.991 Thesis	6
or	
5.993 Special Project	2 or 4

22 to 26

The remaining hours are satisfied through a suitable choice of electives. At least six hours of these electives, plus the general area of the thesis or project, will come from one of the five areas of concentration:

- Management of Technology
- Operations Research and Quantitative Techniques
- Production Engineering and Man/Machine Systems
- Financial and Operational Controls
- Computer and Information Systems

Courses applicable to these areas of concentration are listed at the end of this section of the catalog. Arrangements for and approval of the topic and credit level for the special project or thesis must be made with a member of the full-time faculty of the department.

Master of Science in Engineering Management

General Program

The Engineering Management program is designed to provide an opportunity for engineers interested in careers in managing technical types of activities to strengthen their backgrounds. Emphasis is placed on quantitative tools for problem solving and decision making as well as financial and operational controls and basic management subjects. To assure breadth of subject matter relating to management of technological activities, all students must meet the general requirements plus the courses indicated in each of the five areas of concentration listed below:

Category	Minimum Credits
a. Management of Technology	8 including 5.801
b. Operations Research and Quantitative Techniques	8 including 5.963
c. Production Engineering	4
d. Financial and Operational Controls	4 including 5.830
e. Computer and Information Systems	<u>4</u>
TOTAL	28

Courses applicable to these areas of concentration are listed at the end of this section. The remaining 12 quarter hours required for the degree may be considered as free electives. Students desiring courses in such subjects as economics, business law, labor relations, or marketing, should consult the Graduate School of Business Administration catalog. The amount of credit applied toward the degree must be established by the adviser.

Major Areas of Concentration

One of the five specific areas of concentration may be pursued at the master's degree level as specified in the following paragraphs. Students seeking a degree in Industrial Engineering must have approval of the topic and credit level for the special project or thesis by their faculty adviser. A copy of this approval must then be submitted to the Graduate School of Engineering for inclusion into the student's records.

Students when applying to the department must indicate the degree and the area of concentration they intend to follow. An adviser will be assigned after acceptance is granted into the Graduate School of Engineering. Changes in major after admission must be approved by the student's adviser by written petition, a copy of which must then be submitted to the Graduate School of Engineering office, 214 Hayden Hall.

M. S. I. E. Core Courses

The following courses are required of all students electing a specific major area of study for a Master of Science in Industrial Engineering.

Course	Credits
5.803 Industrial Organizations	2
5.823 Advanced Production Analysis	4
5.905 Analysis with Simulation	2
5.914 Advanced Operations Research	4
5.963 Statistics	2
5.991 Thesis (Master's Degree)	6
or	
5.993 Special Problems in Industrial Engineering	2 or 4
	<hr/> 16-20

M. S. E. M. Core Courses

The following courses are required of all students electing a specific major area of study for a Master of Science degree in Engineering Management.

Course	Credits
5.801 Analysis of the Industrial Enterprise I	2
5.830 Financial Management I	2
5.905 Analysis with Simulation	2
5.963 Statistics	2
Courses category (A)	6
(Management of Technology)	
Courses category (D)	2
(Financial and Operational Control)	
	<hr/> 16

In addition to the above core courses specific requirements for the major selected must be completed from the five specific areas of concentration that follow.

Assurance Sciences Major

Assurance sciences comprise engineering and management disciplines in reliability, maintainability, quality-control, integrated logistic support, and other related engineering/manufacturing product-support activities. The assurance sciences major is aimed at the practicing engineer/manager in assurance sciences who desires to enhance his or her skills, and the engineer/manager whose activities interact with those in the field of assurance sciences who desires to develop a working knowledge of those disciplines.

The following courses are required of all students electing the Assurance Sciences major:

Course	Credits
5.954 Advanced Quality Control	2
5.955 Mathematical Theory of Reliability	2
5.956 Reliability and Maintainability Assessment	2
5.957 Reliability Analysis of Complex Systems	2
5.964 Design of Experiment I	2
5.912 Network Planning and Control	2
Courses category (B)	4
(Operations Research and Quantitative Techniques)	—
	16

The courses selected from Category (B) must have adviser approval to insure that a cohesive program in either quality control engineering or reliability/maintainability engineering has been followed.

Computer and Information Systems Major

The Computer and Information Systems (C&IS) major is designed to meet the needs of students desiring a concentration in the design of management information systems to support decision processes and the hardware and software concepts necessary for the implementation of such systems. The emphasis placed on each area depends on the professional objectives of the student and the programs should be developed in consultation with the adviser.

The following courses are required of all C&IS majors:

Course	Credits
5.830 Financial Management I	2
Courses from category (E)	14
(Computer and Information System)	—
	16

Health Systems Major

The purpose of the Health Systems major is to give the opportunity for the development of professionals with a strong systems analysis orientation in order to contribute to the design and improvement of the delivery of health care services. The program places strong emphasis upon the use of quantitative and computer techniques.

The following courses are required of all students electing the Health Systems major:

Course	Credits
5.860 Health Care Organization and Management	2
5.865 Case Studies in Health Systems	2
21.840 Sociology of Medicine (3 q.h.)	2 (allowed)

5.964 Design of Experiments I	2
Category (E)	4
(Computer and Information Systems)	

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Human Factors Major

The Human Factors major gives the opportunity for specialized preparation for the design of equipment and work places with emphasis upon occupational safety and health and upon provision of an effective man/machine interface. All Human Factors majors will be expected to fulfill the 12 quarter hours listed below as general requirements, and further to take at least six quarter hours from the Human Factors technical electives list.

Course	Credits
5.964 Design of Experiments I	2
5.965 Design of Experiments II	2
5.819 Human Factors in Man-Machine Systems	2
5.852 Human Factors — Work and Environment	2
5.854 Human Factors Engineering — Data Base	2
5.855 Human Factors Engineering — Application Methods	2
	12
Human Factors electives (see below)	6
	18

Human Factors Electives

5.817 Advanced Work Design	2
5.814 Development of Engineering Managers	2
5.816 Industrial Psychology of Engineers	2
5.853 Man-Computer Interaction	2
5.862 Introduction to Occupational Health and Safety	2
5.863 Technical Aspects of Health and Safety	2
5.864 Topics in Physiology and Biomedical Engineering	2
5.991 Thesis	6

Operations Research Major

The major in Operations Research is intended to provide the opportunity for extensive course work in application of quantitative techniques to the solution of problems in manufacturing or service industries. The courses are designed to provide a rigorous mathematical basis plus a focus on application of the techniques. Program flexibility is intended to permit students reasonable freedom to pursue topics most appropriate to the individual career development.

All students electing the Operations Research major are required to take:

Course	Credits
Category (B) Operations Research	14
(must include 5.914)	
Category (E)	<u>4</u>
	18

THE INDUSTRIAL ENGINEER DEGREE

Description

This degree is designed for those who wish to undertake graduate study beyond the master's degree which is less extensive and more applied than that required for the doctorate. The program leading to the Industrial Engineer degree permits a candidate to pursue a course of study at the upper graduate level which will develop in-depth knowledge in selected Industrial Engineering techniques, and the ability to apply these techniques to complex problems in a real-world setting. The candidate will work closely with a faculty adviser throughout the program.

Credit Requirements

A minimum of 40 quarter hours beyond the master's degree is required. Normally ten quarter hours of credit out of the 40 will be granted for work on the Industrial Engineering degree project. A minimum of 20 quarter hours must be taken in Industrial Engineering.

Industrial Engineer Degree Project

In addition to the required course work, to be awarded the degree of Industrial Engineer, the candidate must complete a project demonstrating a high level of competence in structuring and solving a complex real-world problem. The problem to be addressed in this project is of an applied nature. Where applicable, an on-going organization will be used as the setting. The work should lead to a solution which satisfies all technological and organizational constraints, and is therefore capable of being implemented. The topic will be selected by the student and the faculty adviser. Normally, a project committee of three faculty members will be appointed.

Qualifications and Examinations

A student must maintain a B average to qualify for the degree. A final oral examination for defense of the written report of the Industrial Engineer degree project conducted by the student's project committee is also a requirement for the degree.

Residence Requirement

Since the Industrial Engineer degree project requires the structuring and solving of a complex problem, residence requirements will be satisfied by that arrangement, approved by the adviser, which allows the student to devote a sufficient portion of his or her time to the project to permit an intensive problem-solving experience.

COURSE LISTINGS BY AREAS OF CONCENTRATION

Courses in the five categories from which students must select to meet the indicated minimum total credits in the various programs are listed below. Unless otherwise specified, all courses are for two quarter hours of credit. Where courses are listed in more than one category, the student may choose in which category the credit shall apply.

a. Management of Technology

- 5.801 & 5.802 Analysis of the industrial Enterprise I and II
- 5.803 Industrial Organizations
- 5.812 Managing Professional Personnel
- 5.813 Engineering Communication
- 5.814 Development of Engineering Managers
- 5.816 Industrial Psychology for Engineers
- 5.820 Personnel Administration for Engineers
- 5.823 Advanced Production Analysis (4 q.h.)
- 5.841 Engineering Project Management

b. Operations Research & Quantitative Techniques

- 5.903 Inventory Control and Production Planning
- 5.904 Queuing Theory and its Applications
- 5.905 Analysis with Simulation
- 5.906 Principles of Dynamic Systems I
- 5.907 Principles of Dynamic Systems II
- 5.909 Systems Engineering and Analysis
- 5.911 Linear Programming
- 5.912 Network Planning and Control
- 5.914 Advanced Operations Research (4 q.h. credit) (or 5.9A4, 5.9B4)
- 5.916 Engineering Analysis Utilizing Data Processing
- 5.918 Advanced Operations Research I
- 5.919 Advanced Operations Research II
- 5.936 Simulation Methodology
- 5.953 Statistical Decision Theory
- 5.954 Advanced Quality Control
- 5.955 Reliability Theory in Design (formerly Mathematical Theory of Reliability)
- 5.956 Reliability and Maintainability Assessment
- 5.957 Reliability Analysis of Complex Systems

- 5.963 Statistics II (formerly Statistics)
- 5.964 Design of Experiments I
- 5.965 Design of Experiments II

c. Production Engineering and Man/Machine Systems

- 5.806 Production Forecasting
- 5.817 Advanced Work Design
- 5.819 Human Factors - Sensory/Motor
- 5.822 Product Design and Value Analysis
- 5.823 Advanced Production Analysis (4 q.h.)
- 5.852 Human Factors - Work and Environment
- 5.853 Man Computer Interaction
- 5.854 Human Factors Engineering - Data Base
- 5.855 Human Factors Engineering - Application Methods
- 5.862 Introduction to Occupational Health, Safety
- 5.863 Technical Aspects of Health, Safety
- 5.903 Inventory Control and Production Planning
- 5.912 Network Planning and Control
- 5.954 Advanced Quality Control
- 5.956 Reliability and Maintainability Assessment

d. Financial and Operational Controls

- 5.805 Industrial Budgeting for Engineers
- 5.809 Advanced Engineering Economy
- 5.811 Cost Accounting for Engineers
- 5.830 & 5.831 Financial Management I and II
- 5.940 Basic Information Systems Technology
- 5.941 Management Information Systems

e. Computer and Information Systems

- 5.853 Man Computer Interaction
- 5.905 Analysis with Simulation
- 5.906, 5.907 Principles of Dynamic Systems I and II
- 5.916 Engineering Analysis Utilizing Data Processing
- 5.930 Basic Computer Systems Technology
- 5.931 Compiler Design I (formerly Computer Systems)
- 5.932 Compiler Design II (formerly Advanced Computer Systems)
- 5.933 Data Structures for Business
- 5.934 Data Base Management
- 5.936 Simulation Methodology
- 5.940 Basic Information Systems Technology
- 5.941 Management Information Systems
- 5.942 Management Information Systems: Planning and Controlling
M.I.S. Development (formerly Advanced Management Information
Systems)
- 5.943 Centralized vs Distributed Data Processing (formerly
Management Decision Systems Seminar)
- 5.944 Computerized Financial and Inventory Control Systems

- 3.894 Digital Computer Programming II
- 3.895 Digital Computer Programming III
- 3.972 Electronic Digital Computers I
- 3.973 Electronic Digital Computers II
- 3.974 Electronic Digital Computers III
- 3.985 Fundamentals of Automatic Digital Machines I
- 3.986 Fundamentals of Automatic Digital Machines II
- 3.987 Fundamentals of Automatic Digital Machines III
- 3.988 Special Topics in Computer Science
- 3.989 Computer Peripherals

graduate program in transportation (interdisciplinary)

Admission

Individuals who have an interest in Transportation Planning and have an undergraduate degree with the appropriate mathematics background are permitted to enroll in the Interdisciplinary Transportation Program. Inquiries should be addressed to: Northeastern University Graduate School of Engineering, Interdisciplinary Transportation, 214 Hayden Hall, Boston, Massachusetts 02115.

MASTER OF SCIENCE IN TRANSPORTATION

Northeastern University has established a "Master of Science in Transportation" degree program to deal with the special needs of individuals who are preparing themselves for careers in transportation planning. The individual's program of study will aid the individual to acquire the necessary technical skills and social science background required of a transportation planner. Courses from the Colleges of Engineering, Liberal Arts and Business Administration may be included in the student's program of study. In addition to the in-class training, a student will undertake an independent study project that results in a Master's Thesis or Master's Report. A student will work closely with an adviser on some current problem in transportation.

Full-Time Program

The program is arranged in a manner to allow a student to complete the program in one calendar year. Normally, a student will enroll in course work for three academic quarters beginning in September. The student will be eligible for graduation the following September if all course and thesis or report work is complete.

Part-Time Program

The part-time program is the same as the full-time program. The part-time student has a maximum of seven years to complete all degree requirements.

Program of Study

Each student enrolled in the program is required to prepare a program of study which consists of required courses and electives in transportation and related fields. If a student is lacking the necessary mathematics, economics or statistics background, the student may enroll in the prerequisite courses and receive graduate credit. The program of study must consist of a minimum of forty quarter hours of credit and must be approved by the student's adviser.

Required Courses

Credits

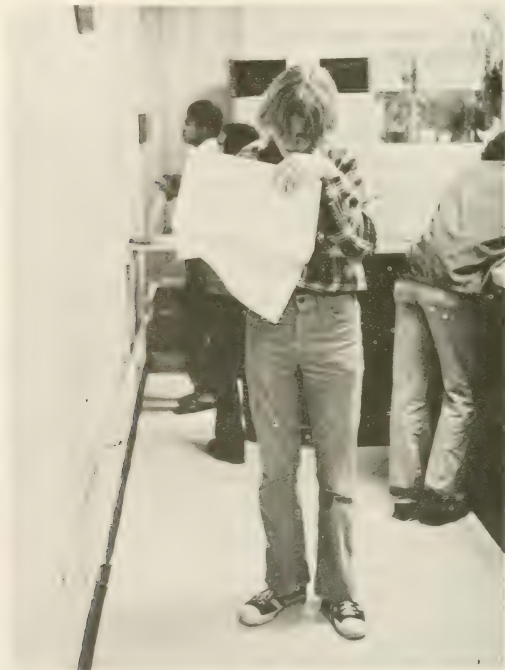
1.234	Transportation Analysis and Planning	4
1.800	Systems Analysis I	4
22.847	The Politics of Transportation	3
39.9L5	Economics of Urban Transportation	3
48.801	Seminar in Intercity Transportation	3
93.820	Thesis	8
	or	
1.838	Master's Report	4

Suggested Electives

1.801	Systems Analysis II	4
1.209	Technology Assessment	4
1.805	Traffic Flow Theory	4
1.806	Urban Transportation Analysis	4
1.819	Environmental Impacts of Urban Transportation	4
1.820	Transportation Engineering	2
5.904	Queuing Theory	2
5.905	Analysis with Simulation	2
5.913	Data Processing (Fortran)	2
5.914	Advanced Operations Research	4
5.941	Management Information Systems	2
22.845	Problems of Urban Administration	3
22.846	Problems of Regional Development	3
39.9K1	Regional Economics	3
39.9L1	Urban Economics I	3
22.842	Techniques of Urban Planning	3
22.841	Problems of Urban Planning	3
22.843	The Politics of Urban Planning	3
5.916	Engineering Analysis Utilizing Data Processing	3
22.861	Grantsmanship	3
48.805	Urban Transportation	3
39.9L2	Urban Economics II	3
39.277	Economics of the Quality of Urban Environment and Control	4
39.9L7	Economics of Intercity Transportation	3
39.9R1	Seminar in Development Planning	3
93.818	Special Topics of Transportation	3

Pre-Requisites (Graduate credit awarded toward M.S. in Transportation Degree)

39.9A0	Introduction to Intermediate Microeconomic Theory	0
1.206	Applied Probability Theory for Civil Engineers	4
	or	
5.960	Engineering Statistics I	2
5.961	Engineering Statistics II	2



description of courses

All courses carry two quarter hours of credit unless otherwise noted. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.

CIVIL ENGINEERING

The courses listed below are of an advanced undergraduate - first-year graduate level. A maximum of eight quarter hours of credit from this group of courses may be applied toward the master's degree.

1.206 Applied Probability Theory for Civil Engineers (4 q.h. credits)

The basic elements of probability theory and their use via the solution of various civil engineering problems encountered in fluid mechanics, construction management, structures, transportation, etc. Probability of events, random variables and distribution, derived distribution, expectation, and common probability models. *Prep. Admission to Graduate School of Engineering.*

1.207 Technology Assessment (4 q.h. credits)

This course is designed to familiarize people with the general concept of technology assessment, emphasizing the unintended or higher order effects of a technology and suggesting the means by which the undesirable impacts might be lessened. By systematically studying the various societal impacts which might result from the use of a technology, it is hoped that the problems arising can be reduced, their solutions found expediently, or alternatives to them made available without a long lag time. Case studies illustrating pertinent points will be used and may include some of the following topics: food additives, SST, polyvinyl chloride, chlorination of water supplies, use of the Ames test for screening possible cancer causing agents, DES, and methods of increasing food availability from the sea.

1.234 Transportation Analysis and Planning (4 q.h. credits)

Principles of the analysis of transportation networks, through the use of the conventional forecasting model system, including trip generation, trip distribution, modal split and traffic assignment.

1.259 Air Pollution (4 q.h. credits)

Theory and practice related to engineering management of air resources, microclimate and dispersion of pollutants, atmospheric chemistry, air pollution instrumentation, control of gaseous and particulate emissions, and design of air pollution control systems. Biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere, and rationale for establishment of air quality criteria and standards. *Prep. Admission to Graduate School of Engineering.*

GRADUATE COURSES

1.800 Systems Analysis I (4 q.h. credits)

The use of quantitative techniques to allocate resources in the planning and design of large physical systems encountered in transportation and environmental engineering. Economic analysis of alternatives; development of mathematical models; classical optimization techniques by calculus; linear programming and extensions; integer, quadratic, separable and approximation programming methods; ranging analysis; network theory. *Prep. Two semesters of calculus.*

1.801 Systems Analysis II (4 q.h. credits)

Additional quantitative techniques for planning and design. Treatment of multi-objective systems; dynamic and geometric programming; decision analysis for selection; utility theory; Markov chains; gaming; introduction to simulation. *Prep. 1.800, Systems Analysis I.*

1.805 Traffic Flow Theory (4 q.h. credits)

Statistical methods in traffic flow theory; probability models, hypothesis testing and its use, queuing theory and simulation techniques. Deterministic methods in traffic flow theory; car following models; various methods of determination of capacity and level of service.

1.806 Urban Transportation Analysis (4 q.h. credits)

Principles of the analysis of urban transportation networks utilizing contemporary methodology such as cross-elasticity models, disaggregate-behavioral (probabilistic) models, and network equilibrium concepts. *Prep. 1.834, Transportation Analysis and Planning.*

1.819 Environmental Impacts of Urban Transportation (4 q.h. credits)

Examination of the human response to noise, water and air pollution; physical effects of pollution in relation to source-receptor configurations and urban scale meteorology; laboratory and field techniques used in measuring pollutant levels; government regulations and guidelines and their effect on urban transportation planning. *Prep. Admission to Graduate School of Engineering.*

1.820 Transportation Engineering (2 q.h. credits)

Description and evaluation of different modes of transportation existing and proposed; their performance and cost characteristics; design, performance, and selection criteria for vehicles and roadbeds. *Prep. Admission to Graduate School of Engineering.*

1.824 Civil Engineering Materials I (2 q.h. credits)

The behavior of civil engineering materials subjected to various loading and environmental conditions. Includes atomic structure and bonding, elastic and plastic behavior of metals, strength and durability of wood, concrete, and bituminous mixes.

1.825 Civil Engineering Materials II (2 q.h. credits)

Continuation of 1.824. Includes composite materials, phase transformations, corrosion, strengthening mechanisms.

1.838 Master's Report (Transportation) (4 q.h. credits)

An individual effort in an area selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.*

1.839 Thesis (Master's Degree) (8 q.h. credits)

Analytical and/or experimental work conducted by arrangement with and under the supervision of the department. *Prep. Permission of the Civil Engineering Department.*

1.841 Structural Analysis I

Review of basic principles of structural analysis, determinacy, indeterminacy, stability. Introduction to energy methods including virtual work and Castigliano's Theorem. *Prep. Differential and Integral Calculus plus Theory of Structures.*

1.842 Structural Analysis II

Contemporary methods of structural analysis with emphasis on lateral load analysis of multistory structures. A complete treatment of moment distribution including non-prismatic members, axial load, and shear distribution. *Prep. 1.841 Structural Analysis I.*

1.843 Structural Analysis III

Introduction to matrix methods of structural analysis, including stiffness and flexibility methods. *Prep. 1.842, Structural Analysis II.*

1.844 Structural Analysis IV

Introduction to advanced structural mechanics, emphasis on theory of elasticity, and development of finite element method of analysis. *Prep. 1.843 Structural Analysis III.*

1.847 Structural Analysis (4 q.h. credits)

This course, offered days, embodies the material in 1.841 and 1.842 — Structural Analysis I and II. *Prep. Differential and Integral Calculus plus Theory of Structures.*

1.849 Model Analysis

Development of the principles of similitude to establish the relationship between behavior in the model and the full-sized structure. Review of techniques to fabricate, to load, and to instrument models. Application and use of strain gauges. The laboratory portion is devoted to model analysis of a complex structure. *Prep. Admission to program and approval of instructor.*

1.850 Seismic Design I

Elastic and inelastic analysis of 1 DOF and M. DOF systems, seismic analysis of building structures, seismic provisions of building codes, structural system and details of earthquake design.

1.851 Selective Topics Seismic Design II

Seismic risk analysis, seismic design decision analysis for buildings, soil-structure interaction during earthquakes, earthquake-caused damages, dynamic stability of slopes and earth-retaining structures, soil liquefaction analysis. Prerequisite: 1.850

1.853 Concrete Structures I

Review of basic characteristics of concrete. Material properties. Prestressed concrete. *Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.*

1.854 Concrete Structures II

Continuation of Concrete I. Additional topics on prestressed concrete design, yield line theory, and folded plate design. *Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.*

1.855 Concrete Structures III

Analysis and design of thin-shell concrete structures including domes, cylindrical shells, and hyperbolic paraboloids. *Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.*

1.856 Structural Analysis (4 q.h. credits)

This course, offered days, embodies the course content offered in 1.843, Structural Analysis III and 1.844, Structural Analysis IV. *Prep. 1.847, Structural Analysis.*

1.857 Structural Dynamics (4 q.h. credits)

This course, offered days, embodies the material in 1.850 and 1.851 — Structural Dynamics I and II.

1.858 Concrete Structures (4 q.h. credits)

This course, offered days, embodies the material in 1.853 and 1.854 — Concrete Structures I and II. *Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.*

1.859 Structural Stability

Elastic and inelastic stability of structures including beams, columns, plates, and shells.

1.861 Design of Structures I

An advanced course in elastic design in structural steel. Design problems involving braced and rigid frame structures subject to gravity, wind, and seismic loads are considered. *Prep. Undergraduate Steel Design and Structural Analysis*

1.862 Design of Structures II

An advanced course in analysis and design in structural steel with emphasis on plastic behavior including rigid frame buildings and braced multistory frame buildings. *Prep. Undergraduate Steel Design and Structural Analysis.*

1.863 Design of Structures III

Advanced problems in elastic and plastic design of structural steel. Topics include curved girders and cable supported structures. *Prep. Undergraduate Steel Design and Structural Analysis.*

1.864 Design of Structures (4 q.h. credits)

This course, offered days, embodies the material in 1.862 and 1.863 — Design of Structures II and III. *Prep. Undergraduate Steel Design and Structural Analysis.*

1.871 Soil Mechanics I

Review of phase relationships, soil consistency, etc.; permeability and capillarity; effective stress concept, analysis of seepage in porous media; stress distribution; introduction to settlement analysis. *Prep. Undergraduate course in basic soil mechanics.*

1.872 Soil Mechanics II

A continuation of course 1.871. The course covers consolidation theory and settlement analysis; shear strength properties of soils; stability analysis of open and braced cuts; and earth pressure theory and analysis. *Prep. 1.871, Engineering Properties of Soils I.*

1.873 Engineering Properties of Soils

Classroom and laboratory studies in soil behavior with emphasis on the compressibility and shear strength of soils.

1.874 Foundation Engineering I

Soil compressibility; case studies of deep-seated settlement; allowable settlements; preloading concepts; bearing capacity; subsurface exploration. *Prep. Undergraduate Soil Mechanics or Foundations.*

1.875 Foundation Engineering II

Design principles of footings, mats and floating foundations; pile foundations; selection of foundation scheme; case studies. *Prep. 1.874, Foundation Engineering I.*

1.876 Foundation Engineering III

Lateral earth pressure theory; analysis and design of retaining walls, anchored bulkheads and braced cofferdams; dewatering; observational approach to design; foundation performance with case studies; cellular cofferdams. *Prep. 1.875, Foundation Engineering II.*

1.877 Soil Mechanics (4 q.h. credits)

This course, offered days, embodies the material in 1.871 and 1.872 — Engineering Properties of Soils I and II. *Prep. Undergraduate course in basic soil mechanics.*

1.878 Foundation Engineering (4 q.h. credits)

This course, offered days, embodies the course content offered in 1.874 and 1.875 — Soil Mechanics and Foundation Engineering I and II. *Prep. Undergraduate Soil Mechanics or Foundations.*

1.882 Engineering Geology

Review of minerals, selected topics in historical and structural geology related to engineering geology; origin and occurrence of various rock types, geologic structures, faulting and joint systems; weathering of rock and weathering products, glaciation, geologic mapping and environmental aspects. *Prep. Undergraduate course in geology.*

1.884 Rock Mechanics I

Interrelationship with other disciplines; index properties; classification systems; laboratory tests; state of stress and stress distribution. *Prep. Undergraduate course in geology.*

1.885 Rock Mechanics II

Behavior of rock under combined stresses; pore pressure effects; failure theories; in-site deformation modulus and shear strength characteristics; field testing. *Prep. 1.884.*

1.886 Soil Dynamics I

Dynamic response analysis of 1 DOF systems, response spectra, characteristics of earthquakes and resulting ground motions, stress-strain behavior of soils during dynamic loading laboratory and field determinations, wave propagation through elastic media.

1.887 Soil Dynamics II

Modal analysis of multi-degree of freedom systems; effect of local soil conditions upon earthquake ground motions; machine foundation design and analysis; ground vibrations, sources and controls; cyclic loading of soils, liquefaction. *Prep. 1.886.*

1.892 Numerical Methods in Structural Mechanics I

Formulation and numerical solution of civil engineering problems in structural mechanics. Emphasis will be on lumped parameter systems. Equilibrium, eigenvalue, and propagation type problems will be covered.

1.893 Numerical Methods in Structural Mechanics II

Continuation of 1.892. *Prep. 1.892, Numerical Methods in Structural Mechanics I.*

1.894 Numerical Methods in Structural Mechanics (4 q.h. credits)

This course, offered days, embodies the material in 1.892 and 1.893 — Numerical Methods in Structural Mechanics I and II.

1.897 Master's Report (Structural) (4 q.h. credits)

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of structural engineering selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.*

1.898 Special Topics in Structural Engineering (2 q.h. credits)

An individual effort in an area selected by student and adviser resulting in a definitive report. Open to day students only. *Prep. Admission to Graduate School of Engineering.*

1.899 Thesis (Master's Degree) (8 q.h. credits)

Analytical and/or experimental work conducted by arrangement with and under supervision of the department. *Prep. Permission of the department.*

1.901 Hydraulics I

Mechanical properties of fluids — fluid statics, continuity, energy relationships (Bernoulli and Euler equations), momentum, dimensional analysis, steady flow in conduits under pressure, pipe systems. *Prep. Undergraduate course in hydraulics.*

1.902 Hydraulics II

Open channel flow — energy relationships, critical flow, controls, momentum principles, flow resistance, uniform flow, gradually varied flow, local phenomena. *Prep. 1.901, Hydraulics I.*

1.903 Hydraulics III

Open channel flow — channel transitions; unsteady flow; potential flow — velocity potential function and stream function; selected topics in hydraulics and fluid mechanics. *Prep. 1.902, Hydraulics II.*

1.904 Hydraulics (4 q.h. credits)

This course, offered days, embodies substantially the material in 1.902 and 1.903 — Hydraulics II and III. *Prep. Undergraduate course in hydraulics.*

1.907 Environmental Statistics

Statistical studies applied to environmental data, including basic statistics; frequency and probability distributions; methods of frequency analysis; multiple linear regression and correlation analysis; introduction to mathematical modeling of environmental processes including discussion of deterministic and stochastic processes. *Prep. Admission to Graduate School of Engineering.*

1.908 Hydrology I

Hydrologic cycle; precipitation studies including data adjustment, spatial and temporal variability, intensity-duration-frequency relationships; abstractions of water due to evapotranspiration and infiltration; groundwater flow, including flow nets and well hydraulics; runoff studies including data adjustment, runoff volume, peak flows, unit hydrographs, flood formulas, and drainage design. *Prep. Not to be taken by students who have completed 1.905.*

1.909 Hydrology II

Drainage and river basin morphology; hydrogeology; streamflow and streamflow routing; storage models of runoff; reservoir routing and design; floods and flood control; case studies in hydrology; water law and policy, urbanization and its effects, reservoir system operation and regulation, alternative uses of water resources, and multipurpose projects; conservation and reuse of water. *Prep. Hydrology I. Not to be taken by students who have completed 1.906.*

1.910 Water and Wastewater Treatment I

Water quality, water impurities and effects, the theory and practice of water treatment, and the elements of design of water treatment works including intake facilities, wells, filtration, coagulation, sedimentation, softening, iron and manganese removal, disinfection, and fluoridation. *Prep. 1.921, Environmental Chemistry II, or equivalent.*

1.911 Water and Wastewater Treatment II

Waste characteristics, the theory and practice of wastewater treatment and disposal, and the elements of design of primary and secondary treatment works, including screening, grit removal, sedimentation, biological treatment processes, sludge digestion and disposal, stabilization ponds, and disinfection. *Prep. 1.910, Water and Wastewater Treatment I.*

1.912 Water and Wastewater Treatment III

Salt water conversion, advanced wastewater treatment, and other special problems in water and wastewater characteristics and treatment, including corrosion control, application of chemicals, radioactive wastes, thermal pollution, and treatment plant instrumentation. *Prep. 1.911, Water and Wastewater Treatment II.*

1.913 Industrial Waste Disposal

Evaluation of industrial waste problems and development of process design for the required treatment facilities; study of various manufacturing processes and their wastewater problems; industrial waste survey techniques; characteristics of industrial wastes; waste reduction methods; physical, chemical, biological, and advanced treatment methods; industrial wastewaters and disposal and treatment of industrial solids and liquids. *Prep. 1.912, Water and Wastewater Treatment III and 1.921, Environmental Chemistry II.*

1.914 Water & Wastewater Treatment (4 q.h. credits)

This course, offered days, embodies the material in 1.910 and 1.911 — Water and Wastewater Treatment I and II. *Prep. Two undergraduate semesters of hydraulics.*

1.920 Environmental Chemistry I

Analytical chemistry principles are studied with reference to environmental engineering applications. The chemistry of processes such as coagulation, iron and manganese removal, ion exchange, softening, and disinfection are included. The principles of spectroscopy and polarography are also discussed. *Prep. Two semesters of general chemistry.*

1.921 Environmental Chemistry II

A continuation of 1.920 including gas transfer, oxidation and reduction, and radiation chemistry. Reaction rates with reference to environment engineering applications such as BOD are discussed. Topics in organic chemistry and instrumental analysis are included. *Prep. 1.920, Environmental Chemistry I.*

See NOTE below regarding courses 1.921, 1.922, and courses 1.930, 1.931.

1.922 Environmental Bacteriology

A study of bacteriology with emphasis on environmental engineering applications. The course includes cell structure, nutrition, morphology, growth, reproduction, and metabolism of bacteria. Effects of environmental factors including inhibition, killing, and natural habitats are discussed. Methods of quantitative bacteriology are also covered. *Prep. 1.921, Environmental Chemistry II.*

1.923 Environmental Chemistry (4 q.h. credits)

This course, offered days, embodies the material in 1.920 and 1.921 — Environmental Chemistry I and II. *Prep. Two semesters of general chemistry.*

1.930 Environmental Analysis I

A laboratory course for the analytical measurement of environmental conditions. Physical, chemical, and biological characteristics are determined by the latest analytical methods with emphasis on their fundamental principles and operational techniques. Interpretation of analytical results for practical applications is also stressed. *Prep. 1.921, Environmental Chemistry II.*

NOTE: It is strongly recommended that this course and 1.931 be taken simultaneously with 1.921 and 1.922.

1.931 Environmental Analysis II

The laboratory analyses are continued with emphasis on the chemical and biological analyses associated with treatment methods; microbiological techniques utilizing microscopy and membrane filter preparation; emphasis on environmental reports. *Prep. 1.930, Environmental Analysis I.*

1.933 Environmental Analysis (4 q.h. credits)

This course, offered days, embodies the material in 1.930 and 1.931 — Environmental Analysis I and II. *Prep. 1.923, Environmental Chemistry taken simultaneously.*

1.935 Unit Operations in Environmental Engineering I

Laboratory scale unit operations illustrating the physical, chemical and biological principles involved in water and wastewater treatment. The aim is to obtain criteria for system design. Topics include disinfection, water softening, sedimentation, chemical coagulation, and ion exchange. *Prep. 1.931, Environmental Analysis II.*

1.936 Unit Operations in Environmental Engineering II

A continuation of 1.935. Topics include biodegradability studies using activated sludge, anaerobic digestion, vacuum filtration, and chemical-physical process involved in wastewater treatment. A comprehensive evaluation of each unit process is required in a report from each student. *Prep. 1.935, Unit Operations in Environmental Engineering I.*

1.938 Unit Operations in Environmental Engineering (4 q.h. credits)

This course, offered days, embodies the material in 1.935 and 1.936 — Unit Operations in Environmental Engineering. *Prep. 1.933, Environmental Analysis and 1.913, Industrial Waste Disposal.*

1.940 Public Health Engineering Survey

An historical survey of public health conditions to introduce the student to the modern approach to public health engineering problems. Applications of engineering principles to such problems as garbage and refuse disposal, control of insect-borne diseases, milk and food sanitation, rodent control, camp and recreational sanitation, housing, control of atmospheric pollution, and radiological health. *Prep. Admission to Graduate School of Engineering.*

1.945 Solid Waste Management

Basic solid waste management for engineering and science students covering storage, collection practices, sanitary landfill principles, incineration practices and reclamation possibilities. *Prep. Admission to Graduate School of Engineering.*

1.950 Air Pollution Engineering

Theory and practice related to engineering management of air resources; applications of models for the atmospheric dispersion of pollutants; analysis of control systems for gaseous and particulate emissions utilizing dry collection, wet collection, absorption, and catalytic processes. Discussion of source control evaluation and air quality standards. Course 1.957 is recommended. *Prep. Admission to Graduate School of Engineering.*

1.951 Radiological Health Engineering

Types and sources of radioactive wastes, methods of handling, storage, and disposition of solid, liquid, and gaseous radioactive wastes. Regulatory agency requirements. *Prep. Admission to Graduate School of Engineering.*

1.952 Industrial Hygiene

Characterization and control of industrial problems associated with noise, heat and ventilation. Physical and biological aspects of environmental stress are discussed. Emphasis is placed on the application of engineering principles to the design of control systems. Evaluation procedures for control effectiveness are reviewed. *Prep. Admission to Graduate School of Engineering.*

1.953 Environmental Microbiology

An advanced course in environmental microbiology. Anaerobic decomposition and eutrophication; transformations of environmental products containing compounds of sulfur, nitrogen, complex hydrocarbons and pesticides. Advanced techniques for the simulation and evaluation of microbiological systems applied to biological control of water and wastewater. *Prep. 1.922, Environmental Bacteriology.*

1.954 Stream Sanitation

Analysis of the disposal of conservative and non-conservative pollutants in streams. Topics include water quality standards, BOD and oxygen relationships in streams, bacterial pollution, eutrophication, thermal pollution, and general corrective control methods in streams. *Prep. 1.920, Environmental Chemistry I.*

1.955 Air Sampling and Analysis

A laboratory course on air pollution measurements utilizing physical, chemical, and instrumental methods and calibration and use of sampling equipment for gaseous and particulate pollutants. Identification and quantitative measurements of pollutants are performed utilizing microscopy, spectrophotometry, gas chromatography, and atomic absorption spectroscopy. *Prep. 1.950, Air Pollution.*

1.956 Air Pollution Control (4 q.h. credits)

This course, offered days, embodies the material of 1.950, Air Pollution Engineering and 1.955, Air Sampling and Analysis. *Prep. Admission to Graduate School of Engineering.*

1.957 Air Pollution Science

Biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere and rationale for establishment of air quality criteria and standards. Note: Course 1.957 is open to non-engineering graduate students as well as engineering graduate students. *Prep. Consent of the department and instructor.*

1.960 Hydraulic Structures I

Dams and associated structures. Design criteria and preliminary analyses for gravity, arch, buttress, rock-fill and earth-fill dams. Foundation treatment and scour protection. Spillway structures. Gates. Navigation requirements of large rivers. Fishways. *Prep. Undergraduate course in hydraulics.*

1.961 Hydraulic Structures II

Intake structures in reservoirs and on rivers. Tunnels and pipe lines: design criteria and structural analyses; economic studies for diameter selection. Penstocks and anchor blocks. Canals — seepage and erosion, linings, canal structures. *Prep. Undergraduate course in hydraulics.*

1.962 Hydraulic Structures III

Surge tanks: selection of type. River regulation: design principles, flood protection and navigation requirements, bank revetments, groins, dikes, and levees. Cofferdams. Operation and maintenance of hydraulic structures. *Prep. Undergraduate course in hydraulics.*

1.970 Design of Environmental Systems (4 q.h. credits)

The development of comprehensive engineering reports. Fundamental design concepts of complete systems for environmental control, including water treatment; wastewater disposal, air quality control, and solid waste disposal; evaluation of economic alternatives for environmental quality control; discussion of actual engineering reports and designs will include considerations of the logic and conclusions. *Prep. 1.912, Water and Wastewater Treatment III.*

1.971 Design of Environmental Systems I (2 q.h. credits)

The development of comprehensive engineering reports. Fundamental design concepts of complete systems, covering half the topics outlined in course 1.970. Includes evaluation of economic alternatives for environmental quality control; discussion of actual reports and designs. *Prep. 1.912 Water and Wastewater Treatment III.*

1.972 Design of Environmental Systems II (2 q.h. credits)

Continuation of design concepts and evaluation as offered in 1.971. Remaining topics outlined in 1.970 will be covered. *Prep. 1.971 Design of Environmental Systems I.*

1.980 Environmental Planning and Management

Examination of the social, technological, economic, political, legal and institutional aspects of environmental planning and management; environmental impact and assessment considerations related to development projects; environmental planning methodology and techniques. *Prep. Admission to the Graduate School of Engineering.*

1.985 Environmental Protection

Environmental quality and its effects on health, comfort, aesthetics, balance of ecosystems and renewable resources; interaction of the water-land-air complex, vector control, food protection, ionizing radiation, other radiation, and the energies of heat and sound. *Prep. Admission to the Graduate School of Engineering.*

1.991 Thesis (Master's Degree) (8 q.h. credits)

Analytical and/or experimental work conducted by arrangement with and under the supervision of the department. *Prep. Permission of the Civil Engineering Department.*

1.992 Special Topics in Environmental Engineering (2 q.h. credits)

An individual effort in an area selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.*

1.993 Master's Report Environmental Engineering (4 q.h. credits)

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of environmental engineering selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.*

1.994 Seminar — Environmental Engineering

Discussions by professional engineers and scientists, faculty, and graduate students on subjects in the area of environmental engineering and science. Open to day students only. *Prep. Consent of the instructor.*

1.996 Seminar — Environmental Health

Discussion by professional people in the public health field, faculty, and graduate students on subjects within the area of environmental health. Open to day students only. *Prep. Consent of the instructor.*

1.997 Thesis (Ph.D. Degree)

Open to day students only. *Prep. Admission to doctoral program in Environmental Engineering*

MECHANICAL ENGINEERING

The courses listed below are of an advanced undergraduate — first year graduate level. A maximum of eight (8) quarter hours of credit from this group of courses may be applied toward the master's degree.

Course	Credits
2.232 Engineering Materials	4
2.233 Thermodynamics of Propulsion	4
2.236 Nuclear Engineering I	4
2.237 Nuclear Engineering II	4
2.258 Gas Dynamics	4
2.260 Heat and Mass Transfer	4

The following undergraduate courses which are given in the daytime, may be elected by graduate students for graduate credit subject to the credit hour restrictions listed above.

2.232 Engineering Materials (4 q.h. credits)

Covers thermodynamics of materials; phase equilibria ternary systems; reactions with environment, i.e. kinetics, oxidation, corrosion, etc.; materials design criteria and materials engineering case studies. *Prep. Admission to the Graduate School of Engineering.*

2.233 Thermodynamics of Propulsion (4 q.h. credits)

Application of the physical principles of thermodynamics, fluid mechanics and plasmas to the prediction of the behavior of propulsion devices; airbreathing engines and rocket engines with applications to show how physical laws describe and limit performance of particular devices. *Prep. Admission to the Graduate School of Engineering.*

2.236 Nuclear Engineering I (4 q.h. credits)

Study of Nuclear Physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fusion and fission; health physics, nuclear instrumentation, and the production and uses of radio-active isotopes; comparison of thermal, fast, and breeder reactor types; discussion of neutron interactions and slowing down; four-factor formula and the diffusion equation developed and applied to one-group theory for bare and reflected thermal reactors; energy production and distribution within the core; flux shaping. Not open to students who have completed 2.942, 2.943, and 2.944. *Prep. Admission to the Graduate School of Engineering.*

2.237 Nuclear Engineering II (4 q.h. credits)

Development of two-group theory for thermal reactors; the physics and safety of fast reactors; effect of reactivity change, either intentional or accidental, changes due to temperature; fission product buildup, xenon buildup after shutdown, and fuel depletion; reactor design considerations including the interrelationship of reactor physics, reactor engineering (physical design heat transfer, etc.), reactor materials and economics; control and distribution of power; fuel cycle management. Not offered to students who have completed 2.942, 2.943, and 2.944. *Prep. Admission to the Graduate School of Engineering.*

2.258 Gas Dynamics

This course continues the study of fluid mechanics with emphasis on compressibility phenomena. The concept of sound speed is introduced and attention is devoted to one-dimensional steady flows. The effects of area change, friction, and heat transfer are considered, including the study of normal shock waves and the behavior of nozzles and diffusers. *Prep. Admission to the Graduate School of Engineering.*

2.260 Heat and Mass Transfer

Heat exchanger design will be presented by both the logarithmic mean temperature difference (LMTD) and the effectiveness - NTU (number of transfer units) methods. This will be followed by a discussion of radiant heat transfer, the nature of solar radiation, and the design of flat plate solar collectors. *Prep. 2.150 Heat Transfer.*

The following are graduate courses which carry two quarter hours of credit unless otherwise noted. Courses carrying four quarter hours of credit are day courses. Seminar and thesis may have varying credits established by the department at the time of registration. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.

2.804 Theory of Elasticity I

Analysis of Cartesian tensors using indicial notation. Stress and strain concepts; point stress and strain; relation to tensor concepts. Governing equations for the determination of stress and displacement distributions in an elastic solid. *Prep. Admission to the Graduate School of Engineering.*

2.805 Theory of Elasticity II

Exact solutions to the governing equations; plane stress and strain problems in rectangular and polar coordinates including thermal stress; torsion of prismatic and axially symmetric bars; bending of thin flat rectangular and circular plates. *Prep. 2.801, Continuum Mechanics or 2.804, Theory of Elasticity I.*

2.806 Theory of Elasticity III

Approximate solutions for stress and displacement distributions in elastic solids; discrete solutions using finite difference and finite element methods; energy principles and the calculus of variations; relation of energy principles to the finite element method; use of energy principles to obtain approximate continuous solutions. *Prep. 2.805, Theory of Elasticity II.*

2.809 Introduction to Plasticity

Basic experimental information. Review of stress and strain tensors. Elastic stress-strain relations. Yield surface. Plastic stress-strain relations. Prandtl-Reuss equations. Simple applications. *Prep. 2.804 Elasticity or equivalent.*

2.810 Advanced Mechanics of Materials I

Review of fundamental stress and deformation concepts; strain energy density; theories of failure. Theorem of virtual work. Non-symmetrical bending. Introduction to variational techniques with application to beams and frames. *Prep. Admission to the Graduate School of Engineering.*

2.811 Advanced Mechanics of Materials II

Analysis of statically indeterminate beams, frames and rings; combined Rayleigh-Ritz Fourier series approach; beams on elastic foundation; stability analysis of beams by exact and approximate methods. *Prep. 2.810, Advanced Mechanics of Materials I.*

2.813 Advanced Mechanics of Materials III

Bending and buckling of thin plates. Introduction to the Finite Element Method. Other selected topics may include simple problems in viscoelasticity and plasticity, depending on class needs. *Prep. 2.811, Advanced Mechanics of Materials II.*

2.815 Plates and Shells

Bending of plates with various shapes, loads, and supports. Large deflection of plates. Membrane theory of shells. Analysis of cylindrical shells. General theory of thin elastic shells. Shells of revolution. *Prep. 2.806, Theory of Elasticity.*

2.819 Fluid Dynamics I

Discussion of a number of kinematic concepts important in the area of fluid dynamics including deformation rate, vorticity, circulation, and the equation of continuity. *Prep. Admission to the Graduate School of Engineering.*

2.820 Fluid Dynamics II

Description of the state of stress in a fluid; derivation of the Navier-Stokes equation and the energy equation; consideration of appropriate boundary conditions; study of some aspects of inviscid motion. *Prep. 2.819, Fluid Dynamics I.*

2.821 Fluid Dynamics III

Study of viscous fluids of uniform constant density; exact solutions of the governing equations; approximate theories appropriate for flows at low and high Reynolds numbers, respectively. *Prep. 2.820, Fluid Dynamics II.*

2.823 Advanced Gas Dynamics

The consequences of fluid compressibility are studied. Shock waves and the theory of characteristics are discussed with specific consideration given to two-dimensional steady flows and one-dimensional unsteady flows. *Prep. 2.820, Fluid Dynamics.*

2.824 Advanced Gas Dynamics

This course continues the subject matter of 2.823. Additional topics may include axially-symmetric steady flow, small-perturbation theory, similarity rules, the hodograph method, or some aspects of physical acoustics. *Prep. 2.823, Advanced Gas Dynamics.*

2.826 Math. Methods for Mechanical Engineers I

Bessel and Legendre functions; boundary-value problems and series of orthogonal functions. Partial differential equations and applications to heat transfer fluid flow, vibrations and wave propagation. *Prep. Admission to Graduate School of Engineering.*

2.827 Math. Methods for Mechanical Engineers II

Functions of a complex variable; Laurent series and singularities; residues and contour integration; conformal mapping and application; introduction to complex transforms. *Prep. Admission to Graduate School of Engineering.*

2.828 Mathematical Methods for Mechanical Engineers III

Matrices and linear equations. Variational calculus and applications. Approximate methods of engineering analysis. Selected topics of current interest. *Prep. 2.826 and 2.827, Math. Methods for Mechanical Engineers I and II.*

2.829 Engineering Fracture Mechanics III

Application of fracture mechanics to fatigue, strain energy density criteria for fracture, arrest criteria. "Work of Fracture" specimen. Application of fracture mechanics to structural analysis. Effect of anisotropy in fracture mechanics. Fracture dynamics, dynamic fracture toughness, strain rate effects. Micro-second fracture phenomenon and criteria, spall, Butcher-Tuler criterion, NAG model. Residual strength, design approaches will be emphasized. *Prep. 2.839, Engineering Fracture Mechanics II.*

2.838 Engineering Fracture Mechanics I

Fundamentals of brittle fracture; theoretical strength, micro/macro fracture characteristic, Inglis-Griffith theory, applicability of same. Linear elastic fracture mechanics; Orowan/Irwin extension to metals, effective surface tension and relation to fracture toughness, plastic zone size correction; geometry effects on fracture toughness; plane strain/plane stress fracture toughness, thickness effects. *Prep. Admission to the Graduate School of Engineering.*

2.839 Engineering Fracture Mechanics II

Experimental determination of fracture toughness; slow crack growth "popin", arrest, R-G curves, compliance techniques for determining elastic energy release rate. Alternate fracture toughness concepts; resistance curve, crack opening displacement, the J integral. Application of fracture mechanics to fatigue. Design methods to minimize risks of catastrophic failure will be emphasized. *Prep. 2.838, Engineering Fracture Mechanics I.*

2.840 Finite Element Analysis Methods

Introduction to the finite element method of numerical analysis; applications in solid mechanics include direct methods, energy approaches and weighted residuals; formulation of simple element stiffness matrices and assembly in one and two dimensions; solids of revolution; brief discussion of complex elements used in large computer programs. Various examples of existing programs to be taken from statics, dynamics, plasticity and heat transfer. *Prep. 2.802, Continuum Mechanics or permission of instructor.*

2.841 Vibration Theory and Applications

Modeling of vibratory systems; one degree of freedom systems (determination of equations of motion using free-body and energy methods); forced and free vibrations through two degrees of freedom; Laplace transformation techniques; phase-plane diagrams for undamped forced vibrations and Coulomb damping. *Prep. Admission to the Graduate School of Engineering.*

2.842 Vibration Theory and Applications

Multiple degrees of freedom; free and forced vibrations with or without damping, extensional and torsional oscillation, frequency equation, energy methods of solution. *Prep. 2.841, Vibration Theory and Applications or 2.861, Systems Engineering.*

2.843 Vibration Theory and Applications

Systems with distributed mass and stiffness; shock and impact; vibrations of beams and related structures; nonlinear and random vibrations. *Prep. 2.842, Vibration Theory and Applications.*

2.845 Shock, Vibration, and Noise Control

Theoretical and practical considerations pertinent to the design and protection of structures and equipment subject to severe environments of transient shock, steady state vibration, random vibration, and acoustic noise. *Prep. 2.843, Vibration Theory and Applications.*

2.846 Non-Linear Vibrations

Studies of various non-linear problems and the techniques used in solving them. Symmetrical and unsymmetrical systems. The Van der Pol-Kryloff-Bogoliuboff method as well as others will be discussed. *Prep. 2.843, Vibration Theory and Applications.*

2.847 Dynamics I

Application of fundamental laws of motion. Transformations of coordinate systems, kinematics of a particle using translating or rotating axis, Lagrange equations, space dynamics. *Prep. Admission to the Graduate School of Engineering.*

2.848 Dynamics II

Dynamics of rigid bodies, moments of inertia in three dimensions, Euler's Equations, includes gyroscopic motion. *Prep. 2.847, Dynamics I.*

2.849 Automatic Control Engineering

Concepts of feedback control; formulation of equations, transfer functions, and block diagrams representing components and systems; linearization; Laplace transformation; stability. *Prep. Admission to the Graduate School of Engineering.*

2.850 Automatic Control Engineering

Study of control action; analysis and design by use of root-locus and frequency-domain techniques. *Prep. 2.849, Automatic Control Engineering.*

2.851 Automatic Control Engineering

Further consideration of linear systems including compensation methods and multiple-inputs. Techniques for the treatment of non-linear systems. *Prep. 2.850, Automatic Control Engineering.*

2.853 Fundamentals of Instrumentation

Theoretical principles underlying the design and operation of instruments for measurement and/or control. Analysis of stimulus-response relations. Industrial instruments for measurement and control, including those based on pneumatic and electrical systems. *Prep. Bachelor of Science degree.*

2.854 Industrial Process Control

Fundamental principles involved in automatic control of industrial processes. Economic considerations. Application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, pH. *Prep. 2.853, Fundamentals of Instrumentation.*

2.855 Solar Thermal Engineering I

This course will emphasize the design of thermal systems for space heating and the heating of domestic hot water. Consideration will be given to the details of design and performance of the collector itself, the energy storage system, and the integrated performance of the entire system. Systems to be considered would be a thermosyphon system for domestic hot water incorporating the use of a flat plate collector consisting of an array of flattened tubes, an air heating collector with an associated pebble bed energy storage, and compound parabolic collectors. *Prep. 4.862 The Energy Crisis: Solar Energy or equivalent background.*

2.856 Solar Thermal Engineering II

This course will emphasize the design of large solar systems intended to generate electrical power from thermal energy. Consideration will be given to the design of the array of reflectors, the solar exchanger, storage system, and power cycle, as well as the optimization of the collector cycle overall thermal efficiency. *Prep. 2.855 Solar Thermal Engineering I.*

2.901 Advanced Thermodynamics

A critical examination of equilibrium thermodynamics from a rigorous viewpoint emphasizing fundamental concepts including: equilibrium, heat, and work; the first and

second law of thermodynamics; energy; heat engines, simple systems, and open systems. *Prep. Admission to the Graduate School of Engineering.*

2.902 Advanced Thermodynamics

Continuation of 2.901 including: examination of temperature scales; entropy and availability; the phase rule, single component systems; thermodynamic relations. Consideration is also given to the ideal gas; chemical potential and thermodynamics of ideal gas mixtures. *Prep. 2.901, Advanced Thermodynamics.*

2.903 Advanced Thermodynamics (4 q.h. credits)

Embodies the material in 2.901 and 2.902 Advanced Thermodynamics. *Prep. Admission to the Graduate School of Engineering.*

2.904 Special Topics in Advanced Thermodynamics

Topics to be considered may vary from year to year depending on the interests of the instructor. Particular emphasis will be placed on the statistical approach in thermodynamics with topics chosen from: (i) equilibrium statistical mechanics; ensemble theory, partition functions, classical and quantum ideal gases, or (ii) kinetic theory of gases; simple kinetic theory, mean free path, transport phenomena, distribution functions, the Boltzmann equation, H-theorem, Chapman-Enskog expansion.

2.905 Cryogenic Engineering

Designed to provide a familiarity with the general field of cryogenics, some of the principal uses of cryogenics, and the ways of obtaining and preserving an environment at a low temperature. Refrigeration, cycle analysis, heat exchanger design, insulation systems, properties of materials, instrumentation problems and applications. Problems will be assigned typical of those which are encountered in the field and laboratory. *Prep. Admission to the Graduate School of Engineering.*

2.906 Cryogenic Engineering

Continuation of 2.905, Cryogenic Engineering. *Prep. 2.905, Cryogenic Engineering.*

2.907 Cryogenic Engineering

Application of Cryogenic Engineering Principles to the design of integrated systems. *Prep. 2.906, Cryogenic Engineering.*

2.910 Conduction Heat Transfer

Basic laws of heat transfer; analytical solutions of single and multidimensional systems in steady and transient states with and without heat sources in cartesian, cylindrical, and spherical coordinates; chart solutions; Newtonian method, steady state and transient numerical analysis; generalized fin equation. *Prep. Elements of Heat Transfer.*

2.911 Convection Heat Transfer

Fundamentals of convection; Reynolds, Prandtl, and Nusselt numbers; elements of boundary layer theory; free and forced convection in ducts and over flat plates solved by dimensional, exact mathematical and approximate integral analyses for both laminar and turbulent flows; Reynolds analogy and Prandtl's modification; boiling and condensation; heat transfer in high speed flow; heat exchangers. *Prep. Elements of Heat Transfer.*

2.913 Radiation Heat Transfer

Basic laws of thermal radiation; Planck black body radiation; Kirchhoff's laws; Stefan-Boltzmann law; radiation properties of surfaces; radiative transfer between gray and non-gray diffuse and specular surfaces separated by transparent media; radiative transfer in the presence of conduction and convective heat transfer. *Prep. Elements of Heat Transfer.*

2.920 Direct Energy Conversion

The fundamental processes of direct energy conversion and their application to the design and operation of magnetohydrodynamic power generators, thermionic converters, and fuel cells. *Prep. Admission to the Graduate School of Engineering.*

2.921 Direct Energy Conversion

Continuation of 2.920. *Prep. 2.920, Direct Energy Conversion.*

2.923 Special Topics in Direct Energy Conversion

Irreversible thermodynamics. Unified theory of energy conversion. *Prep. 2.921, Direct Energy Conversion.*

2.930 Pumps

Deals mainly with centrifugal pumps, with brief references to other types; flow of fluids in pipes and conduits, system curves, pump head velocity diagrams and head development, efficiency; specific speed, net positive suction head, cavitation; affinity laws, selection of pumps to suit various operating conditions and methods of driving, parallel operation; automatic operation, types of construction and materials used, methods of priming centrifugal pumps, pumping of chemicals, oils, and sludges, special problems of pump installation and operation, water hammer in pump discharge lines. *Prep. Hydraulics.*

2.931 Fans and Blowers

Flow of air in pipes and ducts, fan characteristics and laws, various types of fan wheels, inlet and outlet connections, fan capacity control, fan selection and testing. Compression of air and gases, flow in pipes, head-on blowers, performance curves, effect of changes in speed and inlet conditions, construction, regulation, selection, installation, and testing. Axial flow fans and blowers. Positive pressure blowers. *Prep. Thermodynamics.*

2.935 Power Plant Design

Study of the thermodynamic cycles, equipment, and processes of the various types of power plants, with emphasis on modern central station practice. *Prep. Thermodynamics.*

2.936 Power Plant Design

Continuation of 2.935, Power Plant Design. *Prep. 2.935.*

2.938 Power Generation Economics

Integrated study of the various factors affecting cost of power generation, including the effects of fuels availability and pricing, equipment selection and plant efficiency, siting and financial considerations. *Prep. 2.935.*

2.942 Nuclear Engineering I

Topics include: growth of nuclear power industry; study of nuclear physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fission and fusion; radiation health physics; principles of shielding; nuclear instrumentation; production and application of radioisotopes; neutron interactions and slowing down theory; neutron activation analysis. (Not open to students who have completed 2.236 & 2.237.) *Prep. Admission to Graduate School of Engineering.*

2.943 Nuclear Engineering II

Comparison of thermal, fast, and breeder reactors; four factor formula and the neutron diffusion equation; one-group, modified one-group, two-group and multi-group theory; bare and reflected thermal reactors; energy production and distribution within core; flux shaping; transient reactor behavior and control; factors affecting reactivity including temperature, pressure, void formation, fission product accumulation, fuel depletion and fuel breeding; Xenon buildup after shutdown. (Not open to students who have completed 2.236 & 2.237.) *Prep. 2.942.*

2.944 Nuclear Engineering III

Reactor design considerations; interrelationship of reactor physics, control, engineering, materials, safety, and fuel cycle management; reactor types; radiation damage and reactor materials; nuclear fuels; reactor heat transfer; economics of nuclear power; environmental effects. (Not open to students who have completed 2.236 & 2.237.) *Prep. 2.943.*

2.953 Advanced Physical Metallurgy III

The kinetics of phase transformations in metals. Topics include kinetic theory, empirical kinetics, diffusion in metals, nucleation, diffusional growth, martensitic transformations. *Prep. A recent introductory material science course.*

2.954 Advanced Physical Metallurgy I

Dislocation theory; including such topics as dislocation stress fields, self energy, velocity, interactions mechanisms, image forces, and theories of yielding. *Prep. A recent introductory material science course.*

2.956 Advanced Physical Metallurgy II

Mechanical behavior of metals. Application of dislocation theory to micro-plasticity, strain hardening, strengthening mechanisms and creep. *Prep. 2.954, Advanced Physical Metallurgy I.*

2.958 The Structure and Properties of Polymeric Materials I

Introduction to the organic chemistry of polymers, effect of chemical composition on structure, melting point and glass transition temperature, polymer characterization and degradation, thermodynamics of polymers. *Prep. undergraduate Materials Science course.*

2.959 The Structure and Properties of Polymeric Materials II

Rheology and mechanical behavior of polymers, analysis and testing, effects of processing on structure and physical properties, industrial polymers, resin base composites. *Prep. 2.957*

2.960 Thermodynamics of Materials I

Basic metallurgical thermodynamics encompassing first, second, and third laws, entropy, enthalpy, and free energy. *Prep. Engineering Materials.*

2.961 Thermodynamics of Materials II

Continuation of 2.960 with emphasis on solutions, activity, activity coefficients, the phase rule and applications to some metallurgical problems. *Prep. 2.960, Thermodynamics of Materials I.*

2.963 Thermodynamics of Materials III

The application of metallurgical thermodynamics to various process metallurgical problems, i.e., gas-solid systems, etc., plus kinetics of reactions and dynamics systems analysis. *Prep. 2.960 or 2.961, Thermodynamics of Materials I or II.*

2.965 Physical Ceramics

Introduction to ceramic fabrication processes. Characteristic of vitreous and crystalline solids, structural imperfections, and atomic mobility. Phase equilibria, nucleation, crystal growth, solid-state reactions, non-equilibrium phases, and effects on the resulting microstructure of ceramics. *Prep. A recent introductory material science course, Physical Chemistry or Solid State Physics.*

2.966 Physical Ceramics

Discussion of effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials. *Prep. 2.965, Physical Ceramics.*

2.970 Material Science and Engineering I

Principles underlying the structure and properties of solid materials. The relationships of these principles to the properties and to applications in structures and devices. Both macroscopic-phenomenological and electronic-molecular approaches will be used. Materials will include metals and alloys, semiconductors, and dielectrics. Typical subjects are atomic and electronic structures, ordering, nucleation, crystal growth, and thermal properties. *Prep. A recent introductory material science course.*

2.971 Material Science and Engineering II

Continuation of 2.970 into additional topics such as thermal, electric, magnetic, and optical properties; applications of solid-state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth. *Prep. 2.970, Material Science and Engineering.*

2.972 Materials Science and Engineering III

Continuation of 2.971 plus a discussion of various special topics that will vary from year to year. Examples are: metastable phases and thin films. *Prep. 2.971, Materials Science and Engineering II.*

2.975 Introduction to Diffraction Methods in Materials Science

General principles of the diffraction of short wave length radiations; such as x-ray, electrons, and thermal neutrons by materials are studied with emphasis on the un-

derstanding of the similarities and differences of the different radiations when applied to the study of the structures of crystalline and non-crystalline materials. *Prep. A recent introductory material science course.*

2.976 Diffraction Methods in Materials Science

Continuation of 2.975 with emphasis on the experimental methods and applications. This includes: choice of radiation, introduction to instrumentation, sample preparation, methods of detection and recording of the diffracted radiation, analysis, interpretation and use of the results. *Prep. 2.975, Introduction to Diffraction Methods in Materials Science.*

2.985 Powder Metallurgy

Powder characteristics and methods of manufacture. Powder pressing: packing, interparticle bonding, effects of pressure. Principles of sintering. Characteristics and properties of products made from powdered materials. *Prep. A recent introductory material science course.*

2.990 Mechanical Engineering Seminar I (1 q.h. credit)

Introduce first year graduate students to graduate research and the mechanics of undertaking a Master's thesis; research opportunities in the various mechanical engineering disciplines; interdisciplinary research opportunities; definition of a research problem; the role of a thesis advisor; methods of conducting research; writing a Master's thesis. *Prep. Admission to Master of Science Program.*

2.991 Thesis (Master's Degree)

Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. *Prep. Admission to Master of Science Program.*

2.992 Special Problems in Mechanical Engineering

Theoretical or experimental work under individual faculty supervision. *Prep. Consent of department chairman.*

2.993 Special Topics in Mechanical Engineering

Topics of interest to the staff member conducting this class are presented for advanced study. *Prep. Permission of department staff.*

2.994 Doctoral Reading

Material approved by the candidate's adviser (only S or F grades will be assigned for this course). *Prep. Passing of Ph.D. Qualifying Exam.*

2.995 Dissertation (Ph.D. Degree)

Theoretical and experimental work conducted under the supervision of the department. Open to day students only. *Prep. Admission to the Doctoral Program in Mechanical Engineering.*

2.996 Dissertation (Mechanical Engineer Degree)

Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. *Prep. Admission to the Mechanical Engineer Degree Program.*

2.998 Mechanical Engineering Seminar II

Graduate students in their final Master's year will present current results of their thesis work. Non-thesis students will present reports on scientific work that they have pursued in the past or have studied in technical literature. *Prep. 2.990, Mechanical Engineering Seminar I.*

ELECTRICAL ENGINEERING**3.800 Plasma Engineering I**

Behavior, diagnostics, and generation of plasma and gas discharges; emphasis on the engineering and experimental point of view rather than on a rigorous theoretical treatment. Current literature on a variety of plasma engineering applications will be introduced throughout the course. First quarter topics include: dynamics of charged particles in static electric and magnetic fields, E and M wave-plasma interactions, Infinite and Finite Media, elastic and inelastic collisions. *Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, Precs of Modern Electrical Engineering III.*

3.801 Plasma Engineering II

Plasma Electrodynamics. An introduction to linear and nonlinear response functions. The Fluid Models of plasma are developed and are applied to applications in MHD and stability of various thermonuclear confinement schemes. *Prep. 3.800, Plasma Eng. I.*

3.802 Plasma Engineering III

The Kinetic theory of plasma is developed. Emphasis will be on the collisionless or Vlasov approximations. The theory will be applied to the study of microinstabilities in plasma. *Prep. 3.801, Plasma Eng. II.*

3.803 Plasma Engineering (4 q.h. credits)

Offered days. Includes the material given in 3.800 and 3.801 — Plasma Engineering I and II. *Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, Precs of Modern Electrical Engineering III.*

3.806 Lasers I

Review of basic optical principles and atomic physics; introduction to optical coherence; models for the interaction of electromagnetic radiation with matter; a general description of lasers is given. *Prep. Bachelor of Science degree in Engineering or Science.*

3.807 Lasers II

Laser threshold and rate equations; elementary resonator theory and fabrication; giant pulse operation; specific solid-state, liquid, and gas lasers; and laser systems. *Prep. 3.806, Lasers I.*

3.808 Laser Applications

Applications of lasers and laser systems for a variety of engineering and basic science disciplines; specific laser optoelectronic devices. *Prep. 3.807, Lasers II or equivalent.*

3.810 Thermonuclear Fusion Energetics I

Application of the concepts developed in 3.800 and 3.801 to the problem of thermonuclear plasmas. Emphasis will be on magnetic confinement schemes. Both open (mirror machines) and closed (torroidal confinement machines) systems will be discussed. *Prep. 3.801, Plasma Eng. II.*

3.811 Thermonuclear Fusion Energetics II

Continuation of magnetic confinement schemes. Trapped particle instabilities and anomalous transport effects will be discussed. Introduction to interfacial confinement (laser fusion). *Prep. 3.810, Thermonuclear Fusion Energetics I.*

3.812 Thermonuclear Fusion Energetics III

Introduction to Microinstabilities associated with laser fusion devices. Introduction to computer modeling of plasmas. Discussion of recent advances in thermonuclear plasma generation by relativistic electron beams. *Prep. 3.802, Plasma Engineering III; 3.811, Thermonuclear Fusion Energetics II.*

3.817 Physical Acoustics

Radiation, transmission, and absorption phenomena of plane, cylindrical, and spherical waves. Distributed-system analogies, simple sources, dipole sources, radiation impedance, and radiation patterns. Diffraction theory and ray acoustics. The effects of inhomogeneities and of dissipation processes on sound transmission. *Prep. Bachelor of Science degree in Engineering or Science.*

3.818 Aeroacoustics

Theory of acoustic transducers, such as microphones, loudspeakers, and horns. Mechanism of speech production and the acoustic properties of the vocal system. Mechanism of hearing and the acoustic properties of the ear. Noise and noise control in our environment. Room acoustics. *Prep. 3.817, Physical Acoustics.*

3.819 Underwater Sound

Sonar equations. Properties of transducer arrays. Generation, propagation, and reception of underwater sound. The noise background. Detection of signals in noise and reverberation. *Prep. 3.818, Aeroacoustics.*

3.823 Mathematical Methods in Electrical Engineering (4 q.h. credits)

This course, offered days, embodies the material in 3.8C4 and 3.8C5, Mathematical Methods in Electrical Engineering III and IV. (Not open to Northeastern graduates who have completed 3.293). *Prep. Bachelor of Science degree in Engineering.*

3.824 Linear Systems Analysis I (Fundamental Precepts)

A study of the basic concepts of time and frequency domain analysis including differential equations and systems of simultaneous first order equations, integral solutions including superposition and convolution integrals and Green's function solutions; the application of complex variable theory to the study of Laplace and z-transforms; the application of matrix theory to systems analysis. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I. Recommended are courses 3.8C4 and 3.8C5 or their equivalent.*

3.825 Linear Systems Analysis II (State Variable Representation of Systems)

A continuation of program begun with 3.824. Introduction to state variable analysis of continuous and discrete systems. Standard canonical representations. Computer simulation of systems behavior. Solution of state equations for linear time invariant systems. Analysis of transient response. *Prep. 3.824, Linear Systems Analysis I or equivalent.*

3.826 Linear Systems Analysis III (Applications of State Variable and Transform Techniques)

A continuation of 3.825. Extensions of techniques to time varying systems. Stability and related matters. Introduction to optimization and optimal systems. Observability and controllability. Further applications to discrete as well as continuous systems. The application of digital computers to systems analysis. *Prep. 3.825, Linear Systems Analysis II.*

3.827 Linear Systems Analysis through State Variable and Transform Techniques (4 q.h. credits)

Offered days. Includes the material given in 3.825 and 3.826, Linear Systems Analysis II and III. *Prep. Bachelor of Science degree in Electrical Engineering and 3.824, Linear Systems Analysis I or equivalent.*

3.830 Network Synthesis I-A

Matrix circuit analysis including m-port parameter systems. Positive-real functions. Energy functions. Driving-point synthesis techniques for LC, RC, and RL networks. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precs of Modern Electrical Engineering I.*

3.831 Network Synthesis I-B

Driving-point synthesis of RLC networks. Properties of two-port networks. Two-port synthesis, including the parallel ladder realization. Lattice synthesis. *Prep. 3.830, Network Synthesis I-A.*

3.832 Network Synthesis I (4 q.h. credits)

Offered days. Includes the material given in 3.830, Network Synthesis I-A and 3.831, Network Synthesis I-B. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precs of Modern Electrical Engineering I.*

3.833 Network Synthesis II

Scattering, immittance, and hybrid formalisms for linear networks; state-space formulation and techniques for time-invariant and time-varying networks; introduction to passive n-port synthesis. *Prep. 3.831, Network Synthesis I-B or 3.832, Network Synthesis I.*

3.834 Advanced Network Theory I

General realizability of linear lumped and distributed systems; synthesis of reciprocal and non-reciprocal n-port networks; lossless microwave multi-port junctions; stability characterizations of active networks; theory of linear active multi-port networks. *Prep. 3.833, Network Synthesis II.*

3.835 Advanced Network Theory II

Interrelationship between parts of network functions; theory of optimum broadband matching; approximation methods and insertion loss synthesis; analysis and synthesis of transmission line filters and equalizers; gain-bandwidth theory of negative resistance devices including tunnel diodes, varactors, avalanche transit-time, and bulk-effect devices. *Prep. 3.834, Advanced Network Theory I.*

3.837 Introduction to Graph Theory

Fundamentals of graph theory, including blocks, trees, connectivity, partitions, traversability, line graphs, factorization, coverings, planarity, matrices, digraphs, and enumeration problems. Selected applications of graph theory in such fields as network theory, switching theory, and computer science. *Prep. Bachelor of Science degree in Engineering or Science.*

3.838 Nonlinear Circuit Analysis I

Numerical, graphical, and analytical methods for the solution of physical systems described by nonlinear differential equations. Geometric analysis in second-order systems. Perturbation and averaging theory. *Prep. 3.831, Network Synthesis I-B or 3.832, Network Synthesis I.*

3.839 Nonlinear Circuit Analysis II

Linear, time-varying systems and their relationship to certain nonlinear problems. The WJKB approximation. The Hill and Mathieu Equations. Stability of nonlinear systems. Lyapunov Theory. Selected topics in nonlinear analysis according to group interest. *Prep. 3.838, Nonlinear Circuit Analysis I.*

3.840 Linear Active Circuits I

Active networks are developed from device representation and appropriate circuit theory concepts. Topics included are application of flowgraphs and matrices to design and analysis, development of solid state device models, stability, integrated circuitry limitations and dominant pole analysis, and realization from open and short-circuit impedance concepts. These are applied to the realization, operation, and optimization of gainband-width products of wide-band amplifiers to obtain specific characteristics such as Butterworth and other functions. *Prep. Bachelor of Science degree in Electrical Engineering or 3.967, Precis of Modern Electrical Engineering II.*

3.841 Linear Active Circuits II

The results of 3.840, Linear Active Circuits are extended to include narrowband, band pass amplifiers, and feedback amplifier concepts. The effects of feedback upon gain, impedance noise, and stability are developed from return difference and ratio viewpoints utilizing open and short-circuit loop gain concepts. Consideration is given to the synthesis of driving point and transfer functions using active filters, negative impedance converters, and other basic building blocks. *Prep. 3.840, Linear Active Circuits I.*

3.842 Linear Active Circuits (4 q.h. credits)

Offered days. Includes the material given in 3.840, Linear Active Circuits I and 3.841, Linear Active Circuits II. *Prep. Bachelor of Science degree in Electrical Engineering or 3.976, Precis of Modern Electrical Engineering II.*

3.843 Linear Active Circuits III

A continuation of the material covered in Linear Active Circuits I and II. Emphasis will be placed on feedback systems, including multiloop amplifier design. These techniques will be applied to integrated circuit realizations of basic active networks. *Prep. 3.840, Linear Active Circuits I or 3.841, Linear Active Circuits II.*

3.845 Active Network Synthesis

Basic methods of active network synthesis are introduced through three commonly used approaches: feedback amplifier, negative impedance converter, and gyrator; structures of Sallen and Key, Kuh, Linvill, Yanagisawa, Rohrer, Kinariwals, Sepress, and Calahan; consideration of the practical realization of NIC's and gyrators, standard decomposition methods and sensitivity; work of Sandberg, Larky, Newcomb, Daniels, Horowitz, and Thomas. *Prep. 3.831, Network Synthesis I-B and 3.841, Linear Active Circuits II or equivalent.*

3.853 Solid State Device Theory and Practice (4 q.h. credits)

This course meets twice weekly. On one night there is a two-hour lecture; on the other, a three-hour lab. The course carries four quarter hours of credit.

A case method study of solid state devices with a laboratory tightly integrated with the classroom work. The methodology developed is fundamental to the discrete and integrated circuit technology. The classroom portion of the course is devoted to junction diode and bipolar transistor theory including the physics of achieving a given design. In the laboratory, the student designs, builds, and tests diodes and transistors to meet certain electrical characteristics. The devices achieved are seldom of commercial quality, but sufficient equipment is available in the laboratory to make practical device processing possible even for completely untrained personnel. *Prep. An undergraduate level background in electronics and semiconductor devices.*

3.854 Solid State Theory and Practice (4 q.h. credits)

The course is offered on the same basis as 3.853 and is a continuation of that course. The central topic is field effect transistors with appropriate design problems for the laboratory. *Prep. 3.853, Solid State Device Theory and Practice.*

3.8G1 Characteristics and Models of Solid State Devices I

This sequence of three courses is designed to develop real insight into the operation of a broad range of semiconductor devices. Important topics in the physics of semiconductors to provide the background necessary for device analysis are discussed. Analysis of fundamental building-block units of which devices are made including the PN junction, the ohmic contact and the Schottky barrier. Each is examined under reasonable extremes of bias and temperature to establish the electrical behavior expected from such elementary units. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.*

3.8G2 Characteristics and Models of Solid State Devices II

Detailed analysis of the bipolar transistor, metal-oxide-semiconductor interface, its influence on the behavior of real junctions, and the various realizations of the field-effect transistor. *Prep. 3.8G1, Characteristics and Models of Solid States I.*

3.8G3 Characteristics and Models of Solid State Devices III

A continuation of the work of the previous two courses. A detailed analysis of the performance of FET's will permit a critical comparison of field effect and bipolar transistors. Solid state microwave devices; devices that are both unique to microwave applications and the relevant low-frequency elements which require somewhat different analysis at microwave frequencies. An examination of noise in semiconductor devices. *Prep. 3.8G2, Characteristics and Models of Solid State Devices II.*

3.860 Pulse Processing I

The principles and techniques of pulse-forming and pulse-processing circuits will be developed. Pulse forming, switching and time base generators will be covered. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, 3.976, and 3.977, Precs of Modern Electrical Engineering I, II, and III.*

3.861 Pulse Processing II

Continuation of 3.860, Pulse Processing I, to include the pulse processing circuits and the analog/digital interface techniques in radar, digital computation and data processing systems. *Prep. 3.860, Pulse Processing I.*

3.865 Radar Systems I

Emphasis on the systems aspects of radar engineering. Topics covered include antennas; low-noise receivers; high-power transmitters; range, angle, and Doppler tracking systems; search radar systems. Mathematical descriptions are used throughout. *Prep. 3.901, Applied Probability and Stochastic Process II or 3.902, Applied Probability and Stochastic Process I.*

3.866 Radar Systems II

Continuation of 3.865, Radar Systems I, a further consideration of systems aspects. The principles of radar detection theory; matched filter and correlation receiver design; radar ambiguity function; radar uncertainty principles; radar waveform synthesis; fundamental accuracy limits; generalized tracking problems. *Prep. 3.865, Radar Systems I.*

3.867 Radar Systems III

Advanced topics in radar engineering including modern tracking techniques, waveform synthesis, multifunction array radar techniques, and selected topics in radar-sensing techniques and devices. *Prep. 3.866, Radar Systems II.*

3.871 Communications Systems I

Primarily concerned with radio communication systems as used in terrestrial and space communication applications. Antenna gain, space loss, cosmic and atmospheric noise, and receiver noise as factors influencing the signal-to-noise ratio in space and satellite repeater systems; channel models are developed for over the horizon systems utilizing ionospheric propagation and exhibiting fading and multipaths; contemporary systems are discussed from the standpoint of signal spectrum, noise power and message ambiguity as exhibited at the output of the intermediate frequency receiver. *Prep. Background in probability and Fourier analysis.*

3.872 Communications Systems II

Primarily concerned with the theoretical aspects of analogue modulation systems used in radio and space communications. First and second threshold effects will be

discussed in conjunction with signal-to-noise considerations for amplitude and angle modulated systems. Treatment of frequency feedback and phase-lock loops will be included in the discussion of frequency modulation and detection. Frequency division multiplexing will include sub-carrier pre-emphasis and comparative performance figures for SSSC/FM and FM/FM. *Prep. 3.871, Communications Systems I or 3.900, Applied Probability and Stochastic Processes A.*

3.873 Communications Systems III

Continuation of techniques of 3.872 to cover digital modulation systems and time division multiplexing. Adaptive sampling, aliasing, and interpolation will be discussed along with PAM/FM. Pulse code modulation systems utilizing frequency and phase shifted carriers will be compared under noise conditions. Treatment will be given to the use of codes with special correlation, modulation by sequences, and phase-coherent communication. *Prep. 3.872, Communications Systems II.*

3.875 Electromagnetic Theory I

Maxwell's equations and related electromagnetic laws and relations; basic properties of matter; electromagnetic potentials; the scalar and vector Poisson, D'Alembert, and Helmholtz equations; Green's functions; both mathematical and physical aspects of the theory and their relation to engineering applications. *Prep. Bachelor of Science degree in Electrical Engineering or 3.977, Precis of Modern Electrical Engineering III, Advanced Calculus, and Vector Analysis.*

3.876 Electromagnetic Theory II

Basic radiation phenomenon including retarded potentials, radiation from moving charges, electromagnetic energy, and energy-related theorems. Propagation of plane waves in media with real and complex constitutive parameters. Fundamental theory of guided waves. *Prep. 3.875, Electromagnetic Theory I.*

3.877 Electromagnetic Theory (4 q.h. credits)

Offered days. Includes the material given in 3.875 and 3.876, Electromagnetic Theory I and II. *Prep. Bachelor of Science degree in Electrical Engineering or 3.977, Precis of Modern Electrical Engineering III.*

3.878 Advanced Electromagnetic Theory I

More advanced approaches to problems in electromagnetic theory of interest to electrical engineers — for example: waveguide, antennas, diffraction, and scattering; approximation techniques for obtaining useful solutions of field theory problems including integral equation, perturbation, and variational techniques. *Prep. 3.876, Electromagnetic Theory II or 3.877, Electromagnetic Theory.*

3.879 Advanced Electromagnetic Theory II

Special relativity and relativistic electrodynamics. Radiation from moving charges. Statistical concepts and propagation in random media. Introduction to magneto-hydrodynamics and plasma physics. *Prep. 3.878, Advanced Electromagnetic Theory I.*

3.880 Microwave Theory

Propagation of electromagnetic waves on periodic structures. Propagation on a helix. Waves on electron beams. Coupled-mode theory. Traveling-wave devices. Propagation in anisotropic media. Ferrite devices. *Prep. 3.876, Electromagnetic Theory II or 3.877, Electromagnetic Theory.*

3.881 Microwave Circuits I

Review of microwave circuit theorems; scattering matrices and applications; eigenvalue problem; symmetrical and miscellaneous junctions; applications of 3-db couplers; polarizers, phase shifters and attenuators; non-reciprocal and ferrite devices. *Prep.* 3.876, *Electromagnetic Theory II* or 3.877, *Electromagnetic Theory*.

3.882 Microwave Circuits II

One-port resonant cavity; transmission cavity; analysis and synthesis of microwave filters; traveling-wave resonators; periodically loaded lines; selected microwave system considerations. *Prep.* 3.881, *Microwave Circuits I*.

3.883 Advanced Electromagnetic Theory (4 q.h. credits)

Offered days. Includes the material given in 3.878 and 3.879 — Advanced Electromagnetic Theory I and II. *Prep.* 3.876, *Electromagnetic Theory II* or 3.877, *Electromagnetic Theory*.

3.885 Antennas and Probes in Physical and Biological Materials

Basic theory of electromagnetic radiating structures. The application of antennas as probes to measure the geometrical and electrical properties of physical and biological materials. The use of probes to telemetric information from the human body, the measurement and effect of electromagnetic radiation on humans will be covered. *Prep.* 3.876, *Electromagnetic Theory II* or 3.877, *Electromagnetic Theory*.

3.887 Three-dimensional Picture Processing and Reconstruction

The application of computer and optical methods in finding dimensional information from pictures. Particular attention will be given to transmission pictures that arise from x-ray data, electron micrographs or from electromagnetic scattering. Classical and modern methods will be applied to the problem of making three-dimensional reconstruction from two dimensional pictures. *Prep.* *Bachelor of Science degree in Engineering or Science*.

3.890 Electromagnetic Wave Propagation I

Topics in wave propagation of prime importance in communications and space physics. Review of wave propagation in a homogeneous medium. Physical processes in the atmosphere. The formation and structure of the ionosphere. Basic magneto-ionic theory. Propagation of waves in a spatially varying medium. Ray theory. *Prep.* 10.9N2, *Advanced Mathematics or equivalent*.

3.891 Electromagnetic Wave Propagation II

Application of the theory of the oblique incidence of radio waves on the ionosphere, including the effects of the presence of the geomagnetic field, to radio communications. The interpretation of ionograms. Path prediction and field strength computations. Absorption. Top side soundings. Incoherent thermal scatter. Ionospheric irregularities and motions, and their study by space and frequency diversity techniques and other methods. *Prep.* 3.890, *Electromagnetic Wave Propagation I*.

3.893 Digital Computer Programming I

First quarter of a three-quarter sequence of systems programming and language processors. Topics include: machine structure, machine language, assembly language; assemblers, macros, macro-processors; searching and sorting; loaders; data

structures, storage allocation; high-level languages; compilers; operating systems; management of memory, processors, devices; multiprocessing and multi-programming. *Prep. B.S. degree in Engineering or Science and knowledge of a higher level programming language.*

3.894 Digital Computer Programming II

Continuation of 3.893. *Prep. 3.893, Digital Computer Programming I.*

3.895 Digital Computer Programming III

Continuation of 3.894. *Prep. 3.894, Digital Computer Programming II.*

3.898 Combinatorial Mathematics

An introductory course in applied combinatorial mathematics which treats selected topics in enumerative analysis. Particular subjects include permutations, combinations, generating functions, recurrence relations, and the principle of inclusion and exclusion. *Prep. 3.8A1, Mathematical Methods in Computer Science.*

3.899 Combinatorial Methods and Optimization Techniques

Continuation of 3.898 to cover Polya's theory of counting; selected topics in optimization techniques, which include transport networks, matching theory, linear programming, and an introduction to dynamic programming. *Prep. 3.898, Combinatorial Mathematics.*

3.8A1 Mathematical Methods in Computer Science

Algebraic concepts relevant to computer science; sets, relations, mapping, orderings, algebraic systems, Boolean algebras, groups, rings, finite fields, introduction to vector spaces and linear algebras over finite fields. *Prep. Bachelor of Science degree in Engineering or Science.*

3.8C1 Mathematical Methods in Electrical Engineering I

Complex variable theory; mapping by functions, definite and indefinite integrals, Cauchy integral formula, Laurent series, the residue theorem and branch points. Not open to Northeastern graduates who have completed 3.292. *Prep. Bachelor of Science degree in Engineering or Science.*

3.8C2 Mathematical Methods in Electrical Engineering II

A continuation of 3.8C1 that includes application of complex variable theory to Fourier theory, Hilbert transforms, and conformal transformations in the analysis of linear systems and in electrostatics; the Schwarz-Christoffel transformation, Poisson's integral formula and concept of analytic continuation. *Prep. 3.8C1, Mathematical Methods in Electrical Engineering I.*

3.8C4 Mathematical Methods in Electrical Engineering III

Linear algebraic equations; Gauss algorithm; Linear operators in an n -dimensional vector space over infinite and finite fields; characteristic value problem; minimum polynomial; functions of a matrix; Cayley-Hamilton theorem; Sylvester's identity; matrix transformations: equivalence, congruence, similarity; quadratic forms; definiteness; canonical forms under equivalence and congruence transformation; polynomial matrices. *Prep. Bachelor of Science degree in Electrical Engineering.*

3.8C5 Mathematical Methods in Electrical Engineering IV

Smith normal form; determinantal divisors; invariant factors; elementary divisors; canonical forms under similarity; companion forms and Jordan form; method of Jordan chains; Segre, Ferrer, and Weyr characteristics; decomposition of a vector space into invariant subspaces. *Prep. 3.8C4, Mathematical Methods in Electrical Engineering III.*

3.8T0 Numerical Methods and Computer Applications (4 q.h. credits)

This course offered days covers the material in 3.8T1 and 3.8T2, Numerical Methods and Computer Applications, I and II. *Prep. Bachelor of Science degree in Engineering, Mathematics or Physics, a working knowledge of FORTRAN.*

3.8T1 Numerical Methods and Computer Applications I

Survey of numerical methods applied to engineering and scientific problems with emphasis on machine implementation and problem solving; roundoff errors and cumulative errors; difference and summation calculus; roots of polynomials and nonlinear functions; orthogonal functions including polynomials, least squares, and Chebyshev approximation of functions; systems of algebraic equations, matrix notation, and machine implementation; inversion of matrices including iterative methods; sparse matrix techniques. *Prep. Bachelor of Science in Engineering, Mathematics, or Physics; a working knowledge of FORTRAN.*

3.8T2 Numerical Methods and Computer Applications II

Interpolation; numeric quadrature; numeric integration of ordinary differential equations including predictor-corrector methods; stiff dynamic equations, partial differential equations, approximations, boundary value problems. *Prep. 3.8T1, Numerical Methods and Computer Applications I.*

3.8T3 Numerical Methods and Computer Applications III

Linear and dynamic programming, steepest descent and simplex methods, with application to nonlinear functions in n -dimensional space; eigenvalues and eigenvectors of matrices; approximate location of eigenvalues; stability; Routh-Hurwitz criterion; more specialized techniques including the fast Fourier transform, digital simulation of analog computation, system modelling, etc. *Prep. 3.8T2, Numerical Methods and Computer Applications II.*

3.8T7 Digital Filtering I

Representation of discrete signals and systems; z -transforms and discrete Fourier transforms; difference equations and state space representation of discrete systems; design of digital filters; recursive and nonrecursive. *Prep. 3.824, Linear Systems Analysis I or equivalent.*

3.8T8 Digital Filtering II

Algorithms for fast Fourier transforms, e.g., Cooley-Tukey, Sande-Tukey, etc.; radix two, four and arbitrary algorithms; digital spectra, smoothing techniques, spectral window; effects of quantization truncation and parameter inaccuracies; system performance in the presence of noise; applications to signal processing problems and the solution of partial differential equations. *Prep. 3.8T7, Digital Filtering I or consent of the instructor.*

3.8T9 Digital Filtering (4. q.h. credits)

This course, offered days, embodies the material in 3.8T7 and 3.8T8, Digital Filtering I and II. *Prep. 3.824, Linear Systems Analysis I or equivalent.*

3.9A1 Error Correcting Coding I

Error correcting codes and their decoding techniques which show promise for applications in digital communication, control and computer systems. Emphasis placed on the linear block codes based on algebraic structures; cyclic codes for random error correction (B-C-H codes) and burst error correction. Some knowledge of elementary aspects of modern algebra is desirable but not necessary. Not to be taken by students who have completed 3.904. *Prep. Bachelor of Science degree in Engineering or Science.*

3.9A2 Error Correcting Coding II

Convolutional codes and decoding including the Viterbi algorithm, arithmetic codes. Combination of codes. Coding for ranging and synchronization. Not To Be Taken By Students Who Have Completed 3.908. *Prep. 3.9A1, Error Correcting Coding I or 3.905, Information Theory and Coding.*

3.9C1 Data Transmission I

Deals with the theoretical and practical aspects of digital data transmission in the presence of channel distortion and additive noise. Topics covered in this quarter include the basic binary and M-ary modulation techniques namely, PSK, PAM, FSK, orthogonal and bi-orthogonal signaling, and their performance in an additive Gaussian noise channel; signal design techniques for band limited channels; Nyquist criteria; effect of channel amplitude and delay distortion on performance; and adaptive equalization. *Prep. 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.*

3.9C2 Data Transmission II

Discussion of several adaptive equalization algorithms for combatting intersymbol interference; maximum likelihood sequence estimation and the Viterbi algorithm; the characterization of fading multipath channels; diversity reception techniques; characterization of atmospheric and man-made (impulsive) noise in radio communications, its effect on error-rate performance; and receiver processing techniques for combatting impulsive noise. *Prep. 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.*

3.9D1 Digital Techniques in Optics

An overview of detection, sampling, transmission, data processing, and display of optical signals. Topics include linear systems theory of imaging; scanning techniques including photo divide arrays; digital holography; picture compression, enhancement, and reconstruction; adaptive optics; data transmission over fiber optics; and hardware for picture processing facility. *Prep. Linear System Theory or familiarity with Fourier Transforms.*

The two-part sequence which follows serves to introduce students in engineering and physics to the notions of probability, random variables and stochastic processes.

3.900 Applied Probability and Stochastic Processes I

Introductory probability, sample space and random variables, examples of discrete and continuous probability distribution functions, averages, moments and characteristic function, multivariate distributions, change of variables and functions of variables, central limit theorem, description of stochastic vectors. *Prep. Bachelor of Science degree in Engineering or Science.*

3.901 Applied Probability and Stochastic Processes II

General concepts of stochastic processes, stationarity and ergodicity, stochastic continuity and differentiation, the Gaussian process, linear systems with stochastic inputs, correlation functions and power spectra, matched filtering, stochastic orthogonality and linear mean-square estimation filtering and prediction. *Prep. 3.900, Applied Probability and Stochastic Processes I.*

3.902 Applied Probability and Stochastic Processes (4 q.h. credits)

Includes the material given in 3.900, Applied Probability and Stochastic Processes I and 3.901, Applied Probability and Stochastic Processes II. *Prep. Bachelor of Science degree in Engineering or Science.*

3.903 Information Theory

Deals principally with three aspects of information theory; the statistical description of sources and the probabilistic measure of their information contents, the determination of channel capacity, and the fundamental coding theorems. *Prep. 3.900, Applied Probability and Stochastic Processes I or 3.902, Applied Probability and Stochastic Processes or Probability.*

3.905 Information Theory and Coding (4 q.h. credits)

Includes the material given in 3.903, Information Theory and 3.9A1, Error Correcting Coding. *Prep. 3.900, Applied Probability and Stochastic Processes I or 3.902, Applied Probability and Stochastic Processes.*

3.906 Detection and Estimation Theory A

This course presents the classical theory of signal detection and estimation. Particular topics include: likelihood ratio tests for detection of known or random signals; calculation of error probabilities; the signal selection problem; and maximum likelihood estimation of signal parameters. *Prep. 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.*

3.907 Detection and Estimation Theory B

This course is a continuation of 3.906 stressing application of the theory. Particular topics include: synthesis of an adaptive receiver; ambiguity function; estimation of angle modulated signals; and selection of features and training algorithms in pattern recognition. *Prep. 3.906, Detection and Estimation Theory A.*

3.908 Special Topics in Communication Theory

Current aspects of communication theory not covered in previous courses. Subject matter may change from year to year.

3.909 Detection and Estimation Theory (4 q.h. credits)

Offered days. Includes the material given in 3.906 and 3.907, Detection and Estimation Theory A and B. *Prep. 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.*

3.910 Nonlinear Systems I

Operators and functionals. Functional power series representation of nonlinear systems. Functional representation of the response of a nonlinear system when its input is either a constant, a sinusoid, a transient. System transforms. Applications to the analysis and synthesis of nonlinear systems in terms of functional power series. *Prep. An undergraduate course in Signals and Systems and 3.900, Applied Probability and Stochastic Processes I or equivalent.*

3.911 Nonlinear Systems II

Nonlinear systems with random inputs. Functional representation of the response of a nonlinear system when its input is a random process. Orthogonal systems of functionals. Representation and analysis of nonlinear systems in terms of orthogonal systems of functionals. The optimum nonlinear filter, predictor, and general operator. Special classes of nonlinear systems. Determination of optimum nonlinear systems for generalized error criteria. *Prep. 3.910, Nonlinear Systems I and either 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.*

3.912 Nonlinear Systems III

Functional analysis of systems characterized by nonlinear differential equations. Operator approach to system theory and its relationship to differential equation representations. The methods of iteration in nonlinear theory and its application to feedback systems. *Prep. 3.911, Nonlinear Systems II.*

3.913 Optical Storage and Display

Survey of materials and methods for the storage and display of information. Topics included are: photographic film, holograms, storage tubes, magneto-optical films, photochromic materials, electro-optical crystals, evaporated thin films and liquid crystals. *Prep. 3.914, Electro-Optics I or equivalent.*

3.914 Electro-Optics I — Introduction

Introduction to the principles of electro-optical systems; imaging and nonimaging devices. Topics included are: optical imaging, sources, detectors, transmission, absorption scattering, polarization, system evaluation and limitation. *Prep. 10.8A4, Advanced Mathematics or 3.823, Mathematical Methods in Electrical Engineering or equivalent.*

3.915 Electro-Optics II — Imaging Devices

Detailed theory of image formation; evaluation of optical instruments; detailed description of representative systems; test procedures and critical alignment techniques. *Prep. 3.914, Electro-Optics I or equivalent.*

3.916 Fourier Optics I

This two-quarter sequence covers: optical diffraction and imaging problems as linear systems; necessary tools of Fourier Analysis and linear systems analysis which occur when solving the scalar wave equation; waves and their properties; reflection, refraction, polarization, and propagation of waves; foundations of scalar diffraction theory — including Fresnel and Fraunhofer diffraction, interferometry, division of amplitude, division of wavefront, interferometric instrumentation, Fourier transforming, image properties of lenses, coherent and incoherent imaging; and advanced topics in the

application of communication theory to optical problems, transfer and spread functions, spatial filtering, and holography. *Prep. 3.915, Electro-Optics II or equivalent.*

3.917 Fourier Optics II

Continuation of 3.916. *Prep. 3.916, Fourier Optics I.*

3.918 Experimental Optics I

Should be taken concurrently with 3.915, Electro-Optics II.

1 hour lecture, 2 hours laboratory.

3.919 Experimental Optics II

Should be taken concurrently with 3.916, Fourier Optics I.

1 hour lecture, 2 hours laboratory.

3.920 Experimental Optics III

Should be taken concurrently with 3.917, Fourier Optics II.

1 hour lecture, 2 hours laboratory.

The laboratory course provides practical experience in experimental optics to supplement the theory developed in the electro- and Fourier optics lectures. Topics include: geometrical properties of lenses, aberrations, and resolution measurements; diffraction effects in optics and in lens systems; interferometric techniques applied to precise optical measurements and to image evaluation. Optical transfer function, spatial optical filtering and Fourier transformation concepts are studied in the laboratory; investigation of holographic techniques and the coherence of light.

3.921 Optical Properties of Matter I — Crystals

Optics of crystals; classification and effects of crystal symmetry on optical properties; classical description of wave propagation in crystals; applications of the theory to modulation, pulse generation, non-linear optics. *Prep. 3.914, Electro-Optics I.*

3.922 Optical Properties of Matter II

Introduction to electro-optical and magneto-optical effects in material media; linear and non-linear optical materials; elasto-optic and acousto-optical materials; polarization and propagation effects; modulation. *Prep. 3.921, Optical Properties of Matter I — Crystals.*

3.923 Optical Properties of Matter III

Thin films and optical fibers; multilayer filters; dichroics; integrated optics. *Prep. 3.922, Optical Properties of Matter II.*

3.924 Advanced Topics in Electro-Optics

Special topics in modern optics and optical techniques requiring the presentation of a paper by participants at termination of the course. *Prep. Consent of the Director of the Electro-Optics Program.*

Additional courses on the optics sequence are 3.980, 3.981, 3.982, 3.983, and 3.984.

3.925 Power Circuit Analysis I

Fundamental concepts of single-phase and polyphase power systems; definitions of terms; use of per unit quantities; equivalent circuits of symmetrical 3-phase systems; introduction to symmetrical components; short circuits on systems with a single power source. *Prep. Bachelor of Science degree in Electrical Engineering.*

3.926 Power Circuit Analysis II

This course is a continuation of 3.925, Power Circuit Analysis I. Sequence impedances of various power-system elements are considered from application point of view; unsymmetrical faults on otherwise symmetrical 3-phase systems; open conductors and asymmetrical connections and loadings; analysis of simultaneous faults on 3-phase systems. *Prep. 3.925, Power Circuit Analysis I.*

3.927 Power Circuit Analysis III

This course is a continuation of 3.926, Power Circuit Analysis II. Introduction of Clarke components and applications in analysis of asymmetrical systems and faults; application of Clarke components to the solution of surge phenomena problems; transmission line theory; fundamentals of systems stability. *Prep. 3.926 Power Circuit Analysis II.*

3.928 Analysis of Power Systems (4 q.h. credits)

Offered days. This course is designed to provide the basic material, including special mathematical techniques, applicable to the solution of problems associated with power systems. The sequence-impedance characteristics of various power-system elements are investigated with emphasis on application rather than design. Abnormal situations including simultaneous faults and system transients are treated in depth, making use of Clarke components and modified Clarke components as well as symmetrical components. Polyphase transmission line theory, system protection and system stability are introduced and discussed briefly. *Prep. Bachelor of Science degree in Electrical Engineering.*

3.929 Solid State AC and DC Motor Control Systems

The application of solid-state devices to the control of AC and DC electrical machinery, including rectifiers, inverters, choppers and cyclo-converters, as applied to drive systems in industry and transportation. The course will emphasize a case-method approach. *Prep. A background in electric machinery.*

3.930 Power System Planning

Engineering and economic considerations underlying the planning and development of modern interconnected power systems. Consideration of overall planning strategies involved in economic comparison of alternative development schemes. *Prep. 3.925 Power Circuit Analysis I.*

3.931 Power System Planning (4 q.h. credits)

Offered days. Includes the material given in 3.930 but with more extensive and in-depth coverage. *Prep. 3.928, Analysis of Power Systems or equivalent.*

3.932 Power Systems Protection

Consideration of protection applied to generation, transmission, and distribution. Investigation of the characteristics and operating principles of various methods of protective relaying; analysis of current techniques pertaining to system protection. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

3.933 Power System Transients

Transients in power systems due to system switching, lightning, or faults. Traveling-wave phenomena; insulation coordination; overvoltages due to disturbances on the system; surge protection. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

3.935 Computers in Power Systems I

Techniques used in solving power system problems with the digital computer. Matrix formulations are examined, followed by a detailed treatment of the short-circuit problem, including balanced and unbalanced faults. Various iterative techniques are studied for the solution of the power-flow problem. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.*

3.936 Computers in Power Systems II

Practical considerations of solving large scale networks are discussed. Network reductions, distribution factors and contingency analysis techniques are developed. Digital models for regulated generators, fixed and load tap changing transformers and HVDC transmission lines are examined. Computer methods for economic dispatch, loss coefficients and application of pumped hydro are developed. *Prep. 3.935, Computers in Power Systems I.*

3.937 Computers in Power Systems III

Computer methods for solving differential equations for application to transient stability problems are examined in detail. Approximate stability models are developed. Introduction to online state estimation, examination of linear estimation models, development of general estimation equations, iterative and direct power system state estimation procedures are discussed. The application of linear programming techniques to power system problems is examined. *Prep. 3.936, Computers in Power Systems II.*

3.938 Computer Control and Analysis of Power Systems (4 q.h. credits)

This course, offered days, combines the evening courses 3.935, 3.936, 3.937. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.*

3.940 Electric Machinery Theory I

Review of synchronous machine construction; Park's transformation; per unit systems and steady-state analysis of synchronous machines. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, 3.976, and 3.977, Precs of Modern Electrical Engineering I, II, and III.*

3.941 Electric Machinery Theory II

Analysis of the transient behavior of synchronous machines; application of symmetrical components and consideration of fault currents and torques. *Prep. 3.940 Electric Machinery Theory I.*

3.942 Electric Machinery Theory III

Synchronous machine dynamics; analysis of balanced and unbalanced faults; starting and out-of-step operation; protection and control of synchronous machines; analysis of the a-c induction machine. *Prep. 3.941, Electric Machinery Theory II.*

3.943 Advanced Power Laboratory

Offered days. In-depth investigations of the steady-state and dynamic modes of operation of rotating machines. Polyphase rectification and control circuits. Experimentation in other related power areas. *Prep. Bachelor of Science degree in Electrical Engineering.*

3.944 Special Topics in Power

Offered days. (Part-time students may enroll in this course only by special arrangement.) Directed reading and discussion of topics of special interest in the power field. Series of lectures by guest speakers from industry on topics of particular interest to the power student. *Prep. Permission of instructor.*

3.945 Power System Dynamics

Transient system models; small and large scale oscillations; solution of swing equation for single and multi-generator cases; load frequency and voltage controllers and transient stability. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

3.950 Systems Analysis I-A

Review of probability and statistics. Elements of Markov processes, queuing as a Markov process. Finite and infinite queue systems, multiple-server, parallel and sequential queuing; fundamentals of reliability theory. *Prep. Bachelor of Science degree in Engineering or Science.*

3.951 Systems Analysis I-B

Flow-graph representation of queuing systems, equivalence of flow-graph and analog-computer representation; fundamental concepts in game theory; solution of rectangular games; pure and mixed strategies, maximin and minimax principle; zero and non-zero-sum games, infinite games; transformation of games into linear programming problems. Other methods of solving competitive-situation problems. *Prep. 3.950, Systems Analysis I-A.*

3.952 Systems Analysis II

Modelling of systems problems in terms of linear programming approach. Transportation problem; graphical representation and solution of linear-programming problems; allocation problem; simplex method; concept of duality and its use in linear programming. *Prep. 10.8A4, Advanced Mathematics or 10.9N2, Advanced Mathematics.*

3.953 Systems Analysis III

Optimization of stochastic systems. Markov-process approach to the analysis of probabilistic systems. Z-transform analysis of Markov processes. Solution of sequential decision processes by value and policy iteration. Single-chain and multi-chain systems. Sequential decision processes with discounting. Machinery and car replacement problem, and other applications. *Prep. 3.950, Systems Analysis I-A, 3.952, Systems Analysis II, 10.8G1, Probability or equivalent.*

3.954 Systems Analysis (4 q.h. credits)

Offered days. Includes the material given in 3.950 and 3.951 — Systems Analysis I-A and I-B. *Prep. Bachelor of Science degree in Engineering or Science.*

3.955 Studies in Electric Power Transmission I

Elements in the design of AC overhead transmission lines; thermal limitations, series and shunt compensation, environmental effects; consideration of transposition, induced effects, and insulation level. Underground alternatives to overhead lines. Elements of distribution. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

3.956 Studies in Electric Power Transmission II

Fundamental concepts of high voltage DC power transmission; rectifier and inverter performance; regulation; protection; reactive power and filter requirements; practical arrangement of DC lines; the impact of a DC line on overall power system operation. *Prep. 3.927, Power Circuit Analyses III or equivalent.*

3.957 Control System Analysis

Classical analysis techniques for continuous and sampled-data control systems. Discussion of stability criteria; application of root-locus and Bode methods for complementary time and frequency-domain analysis. Consideration of nonlinear systems and development of techniques for stability analysis. Computer simulation of typical control systems will be emphasized. *Prep. Bachelor of Science degree in Engineering; knowledge of transform analysis and some familiarity with FORTRAN.*

3.958 Control System Synthesis

A review of cascade and feedback compensation techniques with the use of classical criteria for design of continuous and sampled-data control systems. Consideration of the multiple-input problem. A survey of pole-zero synthesis methods, and comparison with other techniques. Computer simulation of design examples. *Prep. 3.957, Control System Analysis or equivalent.*

3.959 Control Systems I (4 q.h. credits)

Includes the material given in 3.957, Control System Analysis and 3.958, Control System Synthesis. Open to qualified undergraduate students. *Prep. Knowledge of transform analysis and some familiarity with FORTRAN.*

3.960 Control System Practice

A further study of control systems with emphasis on the practical aspects of control system design. Discussion of digital compensation and computer-in-the-loop realizations. Consideration of system hardware and software problems. Case studies and a field trip will be included. *Prep. 3.959, Control Systems I or equivalent.*

3.961 Optimal Control Theory

Introduction to optimal control theory with reference to aerospace and process control applications. Variational calculus development of the maximum principle. Numerical solutions using dynamic-programming and steepest-descent algorithms. The optimal linear regulator problem and the matrix Riccati equation. *Prep. 3.959, Control Systems I or equivalent.*

3.962 Control Systems II (4 q.h. credits)

Includes the material given in 3.960, Control System Practice and 3.961, Optimal Control Theory. *Prep. 3.959, Control Systems I or equivalent.*

3.963 Stochastic Control Theory

Statistical models for random signals; representation of dynamic systems excited by stochastic inputs. Optimal filtering, prediction and smoothing for discrete and continuous systems. Observer theory and feedback of estimated states for effective closed-loop control in a noisy environment. *Prep. 3.900, Applied Probability and Stochastic Processes I or equivalent.*

3.964 Estimation, Identification, and Control

Estimation theory for dynamic systems based on Bayesian and maximum likelihood methods. The system identification problem. Implementation of numerical algorithms for parameter identification and adaptive control. *Prep. 3.963, Stochastic Control Theory.*

3.965 Control Systems III

Includes the material given in 3.963, Stochastic Control Theory and 3.964, Estimation, Identification, and Control. *Prep. 3.900, Applied Probability and Stochastic Processes I or equivalent.*

3.966 Switching Circuits

This course, offered in winter quarter, days, covers the material in 3.967 and 3.968 Switching Circuits I and II. *Prep. 3.8A1 Mathematical Methods in Computer Science.*

3.967 Switching Circuits I

Logical design of combinational switching circuits, including minimization and decomposition of switching functions; multiple output networks; symmetric networks; threshold logic. *Prep. 3.8A1, Mathematical Methods in Computer Science.*

3.968 Switching Circuits II

Logical design of sequential switching circuits, including the finite-state machine model; iterative networks; capabilities and limitations of finite-state machines; state equivalence; synthesis of asynchronous sequential circuits; state assignment problem and partition theory; machine decomposition. *Prep. 3.967, Switching Circuits I.*

3.969 Switching Circuits III

Selected topics from the theory of finite automata, possibly including such topics as machine experiments; information lossless machines; linear sequential machines; finite-state recognizers. *Prep. 3.968, Switching Circuits II.*

3.972 Electronic Digital Computers I

Basic structural aspects and components of a digital computer; coding of digital information; digital arithmetic and algorithms in binary and complement representations; arithmetic operations, theory of sets, Boolean algebra, truth tables, Karnaugh

maps, minimization; combinational logic design using basic logic elements, including NAND, NOR, Exclusive — OR, etc; Flip-flops, clocks, and sequential logic; state diagrams; analysis and synthesis in synchronous sequential logic. *Prep. Bachelor of Science degree in Engineering or Science.*

3.973 Electronic Digital Computers II

Synchronous sequential logic (cont'd); magnetic and dynamic storage elements; the concept and model layout of a stored-program digital computer; design of an elementary computer including the arithmetic unit, control unit, memory, input/output unit and bus organization, with incorporation of several types of programming instructions that highlight software-hardware interaction; selected topics in digital systems; speed-up arithmetic algorithms. *Prep. 3.972, Electronic Digital Computers I.*

3.974 Electronic Digital Computers III

The use of hardware description languages such as DDL, CDL, APHL; configuration and description of a computer by micro-operations and micro-statements; machine organization of stored-carry addition using Merce's addition algorithm and of a special purpose computer; introduction to micro-programming and micro-program control concepts; examples in microprogramming; functional and operational organization of CPU memory access, memory stack, associative memory, virtual memory, memory addressing and memory loading; selected topics in control, computer and channel organization; computer design simulation techniques in CDL. *Prep. 3.973, Electronic Digital Computers II.*

3.975 Precis of Modern Electrical Engineering I

Prep. Bachelor of Science degree in Engineering or Science plus knowledge of matrix algebra.

3.976 Precis of Modern Electrical Engineering II

Prep. Bachelor of Science degree in Engineering or Science.

3.977 Precis of Modern Electrical Engineering III

Prep. Bachelor of Science degree in Engineering or Science.

3.978 Precis of Modern Electrical Engineering IV

Prep. Bachelor of Science degree in Electrical Engineering or Science.

The preceding four precis courses are intended primarily for those whose undergraduate major was in an engineering or scientific field other than electrical engineering. They are also recommended for students 5 to 10 years away from their bachelor's degree in electrical engineering who feel the need for a review of electrical science. They are open only to students in these categories. The material is basically undergraduate in nature but the viewpoint and depth are at the mature level appropriate to graduate students. Part I deals with the theory of electric circuits and linear systems, Part II with electronics, Part III with field theory from the engineering viewpoint, and Part IV with communication theory especially spectral analysis correlation and modulation.

3.979 Electronic Digital Computers (4 q.h. credits)

This course, offered days, embodies the material in 3.972 and 3.973 — Electronic Digital Computers I and II. *Prep. Bachelor of Science degree in Engineering or Science.*

3.980 Optical Instrumentation Design Concepts

An introduction to the design of optical instrumentation. Principles and basic concepts rather than a rundown of known optical systems. In sequence the topics are: introduction, mechanical shock and vibration, kinematic designs, application of third order aberrations, simple optical ray tracing, optical testing, tolerances, optical instrumentation, philosophy, functional design, design for quantity production, quality assurance, "special order" design, industrial design, examples and exercises. *Prep. 3.915, Electro-Optics II.*

3.981 Principles of Optical Detection I — Application

Laws governing radiation and radiometry; properties of real radiation sources; detailed description of detection devices (image forming and signal generating); noise; contrast and MTF; detection systems (imaging devices and ranging devices); electro-optical detector systems analysis. *Prep. 3.915, Electro-Optics II or equivalent.*

3.982 Principles of Optical Detection II — Theory

Review of detector parameters; statistics of detector noise; practical considerations in real detectors; detection, resolution and recognition of signals; heterodyne detection and parametric amplification; sub-nanosecond pulse detection calibration of electro-optical detectors; detectors as system components. *Prep. 3.981, Principles of Optical Detection I.*

3.983 Fourier Optics III

The third in a series covering current topics of interest in this field and optical instrumentation. Application of coherence phenomena to optical instrumentation such as microdensitometers, microscopes, viewers, cameras, spectrophotometric and interferometric instruments; applications of holography, optical data processing and computing, holographic memories, optical modulation, noise and its effects on data collection, synthetic aperture optics and medical application of laser optics. *Prep. 3.917, Fourier Optics II.*

3.984 Spectroscopic Instrumentation

Survey of optical instrumentation employed in analysis and control situations; modern methods of spectrometry and interferometry; optimization of analytical systems; topics in electron spectroscopy, X-ray spectroscopy, microwave spectroscopy, and related fields. *Prep. Bachelor of Science degree in Engineering or Science.*

3.985 Fundamentals of Language and Machine Theory I

First of a three-quarter sequence in theoretical models of languages and computation. Topics include: formal grammars, parsing, lexical analysis techniques; syntax-directed translation schemes; regular and context-free languages; finite automata, pushdown automata; more general languages and their corresponding machine recognizers; an introduction to computability theory; solvability and unsolvability; computational complexity considerations. *Prep. 3.8A1, Mathematical Methods in Computer Science.*

3.986 Fundamentals of Language and Machine Theory II

Continuation of 3.985 *Prep. 3.985, Fundamentals of Language and Machine Theory I.*

3.987 Fundamentals of Language and Machine Theory III

Continuation of 3.986 *Prep. 3.986, Fundamentals of Language and Machine Theory II.*

3.988 Special Topics in Computer Science

Aspects of Computer Science not covered in other courses. The subject matter may change from year to year.

3.989 Computer Peripherals

Survey of various types of modern computer peripherals, systems considerations, displays (CRT; control units, editing features, graphics, etc.); mass storage (magnetic surfaces; flying heads, recording techniques, disks; file organization, search strategies, mass storage, software, etc.); communications terminals (modems, control procedures, store and forward, multiplexers, etc.); tape units (types, consideration of cost vs. performance, tape labels and formats, magnetic recording on tapes, design features, etc.); future trends in peripherals. *Prep. Bachelor of Science degree in Electrical Engineering or related engineering or sciences.*

3.990 Seminar I

A library survey of a selected topic in the general field of electrical engineering with an oral presentation based on this survey. Participation in the departmental seminar program of guest lectures. *Prep. Bachelor of Science degree in Engineering or Science.*

3.991 Seminar II

The preparation of a research paper suitable for publication in a professional journal, plus an oral presentation of this report. *Prep. 3.990, Seminar I.*

3.993 Doctoral Seminar I (non-credit)

Two hours per week of presentation and discussion of topics at a level compatible with a doctoral program. Subject matter may cover a wide range of scientific and engineering fields. (Only S or F grades will be assigned for this course.) *Prep. Passing of Ph.D. Qualifying Exam.*

3.995 Master's Thesis

Analytical and/or experimental work conducted under the auspices of the department. *Prep. Bachelor of Science degree in Engineering or Science.*

3.996 Doctoral Thesis

Theoretical and/or experimental work conducted under the auspices of the department. *Prep. Passing of Ph.D. Qualifying Exam.*

3.997 Doctoral Reading

Material approved by the candidate's adviser. (Only S or F grades will be assigned for this course.) *Prep. Passing of Ph.D. Qualifying Exam.*

3.998 Special Problems in Electrical Engineering

Theoretical or experimental work under individual faculty supervision. *Prep. Consent of dept. chairman.*

3.999 Electrical Engineer Degree Thesis Research.

Prep. Admission to Engineer Degree Program.

CHEMICAL ENGINEERING

4.801 Advanced Chemical Engineering Calculations (4 q.h. credits)

The study of complex material and energy balances is undertaken with the view to apply these to actual plant conditions. *Prep. Bachelor of Science degree in Chemical Engineering, including Differential Equations.*

4.802 Special Topics in Chemical Engineering Mathematics (4 q.h. credits)

Formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Methods covered will include ordinary differential equations, series solutions, complex variables, Laplace transforms, partial differential equations, and matrix operations. Emphasis will be placed on methods for formulating the problems. It will be assumed that the student has been exposed to some of these topics in appropriate mathematics courses. *Prep. Bachelor of Science degree in Chemical Engineering, including Mathematical Analysis.*

4.803 Numerical Techniques in Chemical Engineering (4 q.h. credits)

Digital computer applications to chemical engineering problems. Topics covered include location of roots of linear and non-linear equations, numerical integration, and curve-fitting techniques with emphasis on the numerical solution of ordinary and partial differential equations and to the subject of linear algebra. *Prep. Bachelor of Science degree in Chemical Engineering.*

4.806 Optimization Techniques (4 q.h. credits)

Several mathematical optimization techniques are developed and applied to chemical engineering problems. Emphasis on a thorough understanding of a single, representative technique selected from among many within its class. Topics include single variable search (Fibonacci Search), multi-dimensional search (Pattern Search), linear systems (Linear Programming) and sequential operations (Dynamic Programming). *Prep. Bachelor of Science degree in Chemical Engineering.*

4.811 Special Topics in Chemical Engineering Thermodynamics (4 q.h. credits)

Classical thermodynamics as a method of approach to the analysis of processes of interest to chemical engineers. A study of chemical and phase equilibria involving the various states of matter; prediction and correlation of physical, chemical, and transport properties of gases and liquids; elementary concepts of quantum and statistical mechanics to interpret the empirical properties of classical thermodynamics. Fundamental principles are reviewed to the extent needed. *Prep. Bachelor of Science in Chemical Engineering.*

4.812 Chemical Equilibria

This course embodies those elements of 4.811 which are concerned with the thermodynamics of chemical equilibria. Topics covered include auxiliary functions, the conditions of equilibrium, equilibrium of reactions involving gases, and the phase rule as applied to heterogeneous reaction systems. *Prep. Graduate Standing in Chemical Engineering.*

4.821 Corrosion Fundamentals

Economic factors basic theories, types, behaviors of specific systems, and protection against corrosion are studied. Wherever possible, engineering applications of the principles are emphasized. *Prep. Bachelor of Science degree.*

4.823 Transport Phenomena (4 q.h. credits)

A consideration of the relationships of mass, momentum, and energy transfer. Fundamental equations of change covering the transport of momentum, heat, and mass are developed to illustrate the essential unity of the transport processes. Molecular, microscopic, and macroscopic systems are studied. It will be seen that much of the theory behind the engineering calculations on which the unit operations of chemical engineering are based can be organized and integrated in terms of equations of change. *Prep. Bachelor of Science in Chemical Engineering.*

4.824 Transport Processes

A consideration of the relationships of mass, momentum, and energy transport. Fundamental equations of change for these types of transport are derived and solved for various chemical and physical systems. *Prep. Advanced Mathematics or undergraduate Transport Phenomena or permission.*

4.825 Sampled-Data Process Control

Signal sampling; z-transformation; pulse transfer functions; open and closed loop systems; stability; frequency and z-domain design methods. *Prep. Undergraduate Process Control or permission.*

4.826 Experiments in Process Control

Laboratory experiments related to controllers, control valves, transmitters, attainment of process dynamics by various methods, and control loop performance are performed and analyzed. *Prep. Undergraduate Process Control or permission.*

4.827 Chemical Process Control I

Review of classical control techniques; state variable representation and analysis of continuous systems with applications to process control. *Prep. Undergraduate Process Control or permission.*

4.828 Chemical Process Control II

Frequency domain process dynamics and control system analysis; feedforward and cascade control applications; associated papers from the chemical engineering literature. *Prep. 4.827, Chemical Process Control I or permission.*

4.829 Special Topics in Chemical Process Control (4 q.h. credits)

Review of classical control techniques; state variable representation and analysis of continuous systems with applications to process control. Frequency domain process dynamics and control system analysis; feedforward and cascade control applications; associated papers from the chemical engineering literature. *Prep. Undergraduate Process Control or permission.*

4.830 Advanced Topics in Chemical Process Control (4 q.h. credits)

Topics related to the analysis and synthesis of sampled-data process control systems; associated papers from the chemical engineering literature. *Prep. 4.829, Special Topics in Chemical Process Control or permission.*

4.832 Chemical Data Estimation

Methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigation. Latest empirical

relationships and physical and thermodynamic laws are introduced to obtain data for plant design and other chemical and engineering uses. *Prep. Bachelor of Science degree.*

4.833 Research Techniques I (4 q.h. credits)

The essential techniques of research including experimentation, mathematical modeling, data reduction, and graphical presentation techniques. For students in the non-research options (M.S. and D.Eng.). *Prep. Bachelor of Science degree and registration in non-thesis M.S. or D.Eng. program in Chemical Engineering.*

4.834 Research Techniques II (4 q.h. credits)

Continuation of 4.833. *Prep. 4.833.*

4.835 Analytical and Numerical Techniques (4 q.h. credits)

For students interested in solving comprehensive problems using computer methods. Problems solved in the course will be based on the interest of the students and staff and will be individual. *Prep. Bachelor of Science degree and knowledge of digital computer programming.*

4.837 Modeling and Simulation of Chemical Process (4 q.h. credits)

This course includes the material given in 4.838. In addition, use of chemical process simulation programs, optimal heat exchanger networks, and additional articles from the literature are treated. *Prep. Graduate standing in Chemical Engineering.*

4.838 Modeling and Simulation of Chemical Processes

Consideration of current approaches to steady and unsteady state process simulation. Structure of simulators. Computational efficiency. Convergence acceleration. Articles from the Chemical Engineering literature. *Prep. Undergraduate plant Design.*

4.840 Advanced Management Techniques in the Chemical Industry (4 q.h. credits)

Management techniques applied to the chemical industry. Special attention to management of research organizations and to management of engineering services, such as design, computer, and related activities. *Prep. Graduate standing.*

4.845 Advanced Plant Design Concepts (4 q.h. credits)

Modern approaches to plant design; computer-oriented design, analysis and simulation of chemical processes, use of strategy decision making in design, advanced scheduling and planning techniques. *Prep. Bachelor of Science in Chemical Engineering.*

4.850 Chemical Process Pollution Control (Water) (4 q.h. credits)

Provides chemical engineering students with basic fundamentals for handling environmental problems in the chemical process industries. Water quality requirements and industrial waste characteristics; wastewater treatment processes applicable to environmental engineering; biological treatment processes and equipment; comprehensive design problems involving biological and tertiary treatment; the economics of water treatment and reuse. *Prep. Graduate standing in Chemical Engineering.*

4.855 Wastewater Treatment Technology

Industrial waste treatment technology for various specific contaminants found in industrial wastes with emphasis on the chemical process industries. Information on sources and levels of contaminants, existing methods of treatment, levels of treatment attainable, and associated costs. *Prep. Graduate standing in Chemical Engineering.*

4.860 The Energy Crisis: A Survey

The energy resources of the United States in comparison to the projected demands upon them over the next two decades. Energy sources alternative to fossil fuels such as: nuclear power, hydropower, geothermal and solar power are discussed with regard to the feasibility of their extensive application by the year 2000. Focus upon technical requirements, and economic and environmental impact. *Prep. Bachelor of Science degree.*

4.861 The Energy Crisis: Fuel to Fuel Conversion

Energy problems associated with the oil, gas, and coal industries. The relative merits of various processes for converting one fuel to another, including the gasification of coal to produce either a low-BTU gas or pipeline quality gas. Production of oil from oil shale, coal, and tar sands. *Prep. Bachelor of Science degree.*

4.862 The Energy Crisis: Solar Energy

The role of solar energy as a future energy resource in relation to its present state of development. The characteristics of solar radiation and methods of collecting, storing and converting the energy. Emphasis on documented technical and economic experience with solar energy reported in the literature. Current research proposals aimed at harnessing the sun's energy. *Prep. Bachelor of Science degree.*

4.870 Polymer Science (4 q.h. credits)

Basic concepts of polymers, thermodynamics of polymer solutions and measurement of molecular weight. Physical and chemical testing of polymers. Crystallinity in polymers and rheology of polymers. Physical and chemical properties of polymers. Mechanisms and conditions for polymerization of polymers including step-reaction, addition and co-polymerization. Discussion of carbon-chain polymers, fibers and fiber technology. *Prep. Bachelor of Science degree in Chemical Engineering or Chemistry.*

4.871 Fundamentals of Polymer Processing (4 q.h. credits)

Transport properties of polymer solutions and polymer melts. Modeling and design of polymer processing equipment. Flow models for processes involving heat, mass, and/or momentum transfer. Analysis of flow stability and elastic phenomena. Applications to the design of equipment for extrusion, calendering, coating, fiber spinning, tubular film blowing, injection molding and mixing. *Prep. B.S. in Engineering.*

4.872 Principles of Polymerization (4 q.h. credits)

Introduction to polymers and polymer properties. Mechanisms of polymerization including step polymerization, radical-chain polymerization, emulsion polymerization, ionic-chain polymerization, chain copolymerization and ring-opening polymerization. Stereo chemistry of polymerization and synthetic reactions of polymers. Applications to reactor design of industrially important polymers. *Prep. B.S. in Chemistry or Chemical Engineering.*

4.890 Seminar in Chemical Reactor Analysis (4 q.h. credits)

Effects of fluid mixing, temperature and reaction rate model on the performance of chemical reactors. Specific topics covered are macro- and micromixing in homogeneous media, boundary conditions for tubular flow reactors, stability of non-isothermal reactors, optimal reactor performance and radical polymerization. *Prep. Bachelor of Science in Chemical Engineering.*

4.891 Selected Topics in Kinetics of Chemical Processes (4 q.h. credits)

Theoretical foundations are developed for the investigation and rationalization of chemical reaction rates. Rate theories regarding elementary steps; sequential reactions using the steady-state approximation; correlations of homogeneous and heterogeneous catalysis; matrix methods applied to the analysis of reaction networks. *Prep. Bachelor of Science in Chemical Engineering.*

4.899 Special Topics in Chemical Engineering (4 q.h. credits)

Topics of interest to the staff member conducting this class are presented for advanced study. A student may not take more than one Special Topics course with any one instructor. *Prep. Permission of department staff.*

4.973 Special Topics in Chemical Process Heat Transfer (4 q.h. credits)

Empirical methods and calculations used to design heat transfer equipment for the chemical process industries. Review of basic heat transfer principles. Shell-and-tube calculations for liquid and/or vapor phase heat transfer. Direct contact and other special heat exchanger applications. *Prep. Bachelor of Science in Chemical Engineering.*

4.974 Selected Topics in Fluid Mechanics (4 q.h. credits)

Discussion of statics, kinematics, and stress concepts associated with fluids. Formulation of the general equations of motion with application to laminar and turbulent flow. Topics on boundary layer theory and compressible flow are included. *Prep. Bachelor of Science in Chemical Engineering.*

4.978 Separation Processes (4 q.h. credits)

Calculation and design methods used in processes involving mass transfer. Topics covered include vapor liquid equilibria for binary and multicomponent systems, multicomponent distillation, absorption and extraction. Emphasis is placed on methods and techniques which are common to many separation processes. *Prep. B.S. degree in Chemical Engineering.*

4.990 Seminar

Topics of an advanced nature are presented by staff, outside speakers, and students in the graduate program. This course must be attended by all master's degree candidates. *Prep. Admission to graduate program in Chemical Engineering.*

4.991 Thesis (Master's Degree)

Analytical and/or experimental work conducted under the supervision of the department. For master's degree requirement. *Prep. Admission to Master of Science program in Chemical Engineering.*

4.995 Thesis (Ph.D. Degree)

Theoretical and experimental work conducted under the supervision of the department. *Prep. Admission to doctoral program in Chemical Engineering.*

4.996 Thesis (D. Eng. Degree)

Theoretical and experimental work conducted under the supervision of the department. *Prep. Admission to doctoral program in Chemical Engineering.*

INDUSTRIAL ENGINEERING AND ENGINEERING MANAGEMENT

Unless otherwise specified, the following courses will carry two quarter hours of credit and will be offered in the evening during one or more quarters each year, at either or both campuses as announced in the schedules published by the Graduate School of Engineering.

5.801 Analysis of the Industrial Enterprise I

Introduction for the practicing engineer of some of the phases of business organization, management and operation. Business responsibility to employees, its product, the customer and to the environment in which it operates. What faces the industrial enterprise in its effort to become profitable.

5.802 Analysis of the Industrial Enterprise II

A survey of modern planning, forecasting and budgeting. The financial markets; investing, speculating. Economic growth and controls. The interaction of politics, government and government controls on the industrial enterprise. Concerns of the engineering manager with these topics.

5.803 Industrial Organizations

An analysis of the purpose and functioning of organizations as the basic networks for achievement of goals through coordination of effort, communication, and responsibility. The approach will emphasize the role and function of engineering in organizations and will be based on modern behavioral science concepts. *Prep. admission to program.*

5.805 Industrial Budgeting for Engineers

Budgeting plans, programs, and reports for industry today; an introduction to the essentials of fixed and variable budgeting for production, inventory, sales, cash, capital, and cost-volume-profit analysis. *Prep. 5.810, Industrial Accounting for Engineers or equivalent.* Offered alternate years with 5.811.

5.806 Production Forecasting

Econometric methods of forecasting the demand for industrial products; emphasis on techniques applicable to individual companies and the total demand. The principal tool used is the mathematical model of the causal factors with special attention to determining the reliability of the model. *Prep. 5.963, Statistics or equivalent.*

5.808 Basic Engineering Economy

Economic analysis in formulating business policies and selecting alternatives from possible engineering solutions to industrial problems, present worth, annual cost, and rate of return techniques using discrete compound interest calculations. *Prep. Bachelor of Science degree in Engineering or Science.*

5.809 Advanced Engineering Economy

Principal emphasis on the practical application of the techniques studied in basic engineering economy; problems of implementation through class discussion of

cases and student project; recent advances in the techniques of engineering economy, especially those relating to the consideration of uncertainties. *Prep. 5.808, Basic Engineering Economy or equivalent.*

5.810 Industrial Accounting for Engineers

Introduction of basic accounting principles and procedures; use of accounting data as a management tool; a practical covering of basic cost accounting procedures related to materials, labor, and manufacturing expense cost control; job order, process, and standard cost systems. *Prep. Bachelor of Science degree in Engineering or Science.*
Offered alternate years with 5.805.

5.811 Cost Accounting for Engineers

Cost accounting procedures as established by accountants are studied and evaluated in terms of being considered by the engineer for cost determination of alternative engineering proposals. *Prep. 5.810, Industrial Accounting for Engineers or equivalent.*

5.812 Managing Professional Personnel

Analysis of the particular problems of managing creative people in research, development, and engineering based on current developments in general management theory and the behavioral sciences; technical innovation as part of the overall organization; class discussion of cases and student term papers. *Prep. Bachelor of Science degree in Engineering or Science.*

5.813 Engineering Communication

Exploration of practice in the effective preparation and presentation, both written and oral, of the results of engineering projects and programs as a basis for business decisions: including formal reports, progress summaries, memoranda, and technical papers. The effective use of various media and audio visual aids based on both audience and material. *Prep. Bachelor of Science degree in Engineering or Science.*

5.814 Development of Engineering Managers

Analysis of the problems faced by the engineer in the transition from individual contributor to engineering manager; the challenge of engineering management; integrating profession and management objectives; developing guides for engineering managers to examine their own work and performance and to improve their effectiveness as well as develop managerial skills in their subordinates. *Prep. 5.801, Analysis of the Industrial Enterprise I.*

5.816 Industrial Psychology for Engineers

A general coverage of the application of psychology to industry with emphasis on industrial environments and organization, human relations, group dynamics, tests and measurements, personnel practices, training, and motivation. *Prep. Bachelor of Science degree in Engineering or Science.*

5.817 Advanced Work Design

Basic philosophies of work design; implementation of work design concepts with case studies; study and analysis of models such as work sampling, sequence or flow of work models; repetitive and nonrepetitive work models, and work measurement

models such as standard data; human factors in measuring operator performance; regression analysis approaches; emphasis on development of professional, analytical, and managerial skills and abilities at a systems level. *Prep. Bachelor of Science degree in Engineering or Science.*

5.819 Human Factors — Sensory/Motor

Design of equipment and systems for human use; emphasis on the application of engineering psychology; visual and auditory presentation of information — human information processing and skilled task performance — compatibility and equipment design. *Prep. Bachelor of Science degree in Engineering or Science.*

5.820 Personnel Administration for Engineers

Personnel programs for attracting and retaining technical talent; evaluating effectiveness of major personnel policies including relations with organized labor; modern methods of salary and wage administration; planning profitable relationships among company, supervisors, and employees. *Prep. Bachelor of Science degree in Engineering or Science.*

5.822 Product Design and Value Analysis

Study of design parameters and their effect on development, manufacturing and procurement; functional analysis of components and systems; complete projects and case studies are integrated in the course. *Prep. Bachelor of Science degree in Engineering or Science.*

5.823 Advanced Production Analysis (4 q.h. credits)

Study of advanced problem-solving techniques in the areas of method and measurement, layout and facilities planning, material handling and manufacturing process. Case studies and a course project in a local concern illustrate the concepts presented. *Prep. Bachelor of Science degree in Engineering or Science.*

5.824 Case Studies in Industrial Engineering

Formulation of problems and analysis of situations on topics such as: work measurement, line balancing, plant layout, regression analysis, wage and salary administration, management information systems and network analysis. Class discussion and written analysis of a variety of cases is included. *Prep. 5.823, Advanced Production Analysis.*

5.825 Topics in Production Engineering

Production problems to include: line balancing, plant location, plant layout and material handling, design of manufacturing systems, job sequencing. Course utilizes readings, projects and case studies. (Not open to those who have taken 5.823, Advanced Production Analysis.) *Prep. Bachelor of Science degree in Engineering or Science.*

5.830 Financial Management I

Study of the issues and processes of short-term financing of industrial firms; financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. (Open to Engineering Management majors only.) *Prep. 5.801, Analysis of the Industrial Enterprise I, and 5.810, Industrial Accounting for Engineers, and 5.808, Basic Engineering Economy or equivalent.*

5.831 Financial Management II

Extension of Financial Management I with emphasis on analysis necessary to such long-term financial decisions as issuance of stock or bonds; contracting of leases or loans, and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business. *Prep. 5.830, Financial Management I.*

5.841 Engineering Project Management

Principles and practices of managing engineering projects in the complex environment of rapid technological advance, stiff competition, adverse economic conditions, ever-changing governmental regulations and the constraints of corporate operating policies are considered with a view to acquiring deeper insights to achieving personal and company objectives while meeting contractual commitments. Particular emphasis is placed on planning the effort, organizing and integrating resources, measuring results, understanding proposal requests, writing winning proposals, understanding and meeting contractual requirements, negotiating contracts and changes therein, developing personnel as well as fulfilling entrepreneurial goals. *Prep. 5.812, Managing Professional Personnel, or 5.814, Development of Engineering Managers, or department permission.*

5.852 Human Factors — Work and Environment

Focuses upon the human as a work-performing, heat-generating physiological engine. Examines the implied restrictions upon equipment and work place to provide occupational safety and effective man/machine performance. *Prep.*

5.853 Man-Computer Interaction

Design and evaluation of the man-computer interface in on-line information systems: formatting of visual displays and auditory outputs, techniques to facilitate operator inputs, pacing and control of the interactive sequence, operator training, task analysis and performance testing. Student projects in areas of novel application. *Prep. 5.851, Human Factors — Sensory/Motor.*

5.854 Human Factors Engineering — Data Base

The study of methods and techniques used to obtain and interpret human performance data. Includes examination of experimental methods and problems peculiar to experimentation with human subjects; unobtrusive measures, and non-reactive techniques, survey design and implementation, and systematic observation techniques. *Prep. 5.964, Design of Experiments I.*

5.855 Human Factors Engineering — Application Methods

Systems analysis and man/machine systems; function and task analysis, task allocation, support equipment and training design, error analysis. Occupational safety; preconstruction, periodic; and accident/critical incident analytic techniques.

5.860 Health Care Organization and Management

History of the development and the delivery of health services; health organization functions and inter-relationships of health-oriented organizations; study of certain legal principles and rulings of importance to medical personnel; introduction to interpersonal ethics of patient care. *Prep. Admission to the Graduate School of Engineering.*

5.862 Introduction to Occupational Health and Safety

Accident prevention, accident cost analysis, Federal and local legislation, record keeping requirements under OSHA Act of 1970; occupational safety and health standards, safety programs and inspections, fire prevention and control methods; human behavior and industrial safety, occupational diseases and personnel protective equipment. *Prep. Bachelor of Science degree in Engineering or Science.*

5.863 Technical Aspects of Health and Safety

Safety responsibilities of management and employees; methods of hazard control; accident investigation; recognition of chemical, electrical and mechanical hazards; principles of machine guarding; occupational safety and health standards, safety training; toxicology and first aid and medical services. *Prep. 5.862, Introduction to Occupational Health and Safety or permission of the instructor.*

5.864 Topics in Physiology and Biomedical Engineering

Introduction to specific areas relating to human structure and function, and to the use of engineering techniques for medical diagnosis and therapy. Areas considered include blood and blood components, the cardiovascular system, the kidney and urinary systems and respiratory systems. The course will be taught on a seminar basis. Students will be required to do literature research under the guidance of the instructor. *Prep. Permission of instructor.*

5.865 Case Studies in Health Systems

Readings and discussions of applications of operations research to health care delivery system analysis drawn from current literature. Objective of the course is to develop the ability to distinguish between effective and ineffective applications of operations research in health research. Invited speakers holding line and staff positions in health organizations are employed to demonstrate the value of quantitative techniques in ongoing organizations. *Prep. 5.901, Basic Operations Research I, or 5.902, Basic Operations Research II, or equivalent.*

5.900 Basic Operations Research (4 q.h. credits)

An introduction to the theory and use of deterministic and stochastic models to represent industrial operations. Models included are those of linear programming, dynamic programming, inventory control, waiting lines, and Monte Carlo simulation. Embodies the material in 5.901 and 5.902, Basic Operations Research I and II. Open to both day and evening students. *Prep. 5.962, Engineering Statistics II or 10.8G1, Probability.*

5.901 Basic Operations Research I

Introduction to the theory and use of deterministic models to represent industrial operations; includes linear programming, dynamic programming, networks, and game theory. *Prep. Bachelor of Science degree in Engineering or Science.*

5.902 Basic Operations Research II

Introduction to the theory and use of stochastic models to represent industrial operations; includes queuing, inventory, and Markovian models. *Prep. 5.901, Basic Operations Research I and 5.962, Engineering Statistics III or equivalent.*

5.903 Inventory Control and Production Planning

The design and operation of inventory systems from a scientific management point of

view, including both required theory and practical aspects. Subjects include inventory control models, statistical forecasting, production scheduling techniques, distribution systems, management control and reports, discussion of actual systems, and a case study. *Prep. 5.963, Engineering Statistics or equivalent.*

5.904 Queuing Theory and Its Applications

A development of the theory of queues with emphasis on practical applications, using the latest techniques of Markovian state-transition diagrams to simplify the mathematic model; study of models based on random arrivals and departures including exponential and Erlang service distributions, single and multiple services, series and parallel systems, finite and infinite queues; applications to staffing, inventory control, reliability, maintenance and scheduling. *Prep. 5.900 or 5.902, Basic Operations Research.*

5.905 Analysis with Simulation

Appropriate utilization of simulation as an effective quantitative analysis technique. Course covers when, where, and how to use discrete event simulation techniques. Topics include model design, development and validation, as well as tactical and strategic planning considerations in the use of the model to evaluate alternatives. Several special purpose simulation languages are discussed with emphasis and practical exercise using GPSS. Applications are drawn from both production and service industry settings. *Prep. 5.913, Data Processing for Engineers, 5.962 Statistics I (formerly Probability and Statistics III), or equivalent.*

5.906 Principles of Dynamic Systems I

Introduction to modeling of social systems, emphasizing the study of feedback structures and their behavior; development of concepts that allow one to understand the mechanisms underlying growth, stagnation and cyclical fluctuation; examples and practice at formulating models of industrial, economic, social, and ecological systems; study of some of the effects of delays, multiple feedback loops, and non-linearities; aim to building an intuitive foundation for simulation studies of complex systems. *Prep. Bachelor of Science degree in Engineering or Science.*

5.907 Principles of Dynamic Systems II

Continuation of topics from 5.906 with increased experience in the construction and analysis of generic feedback structures; examination of current and previous System Dynamics applications including Urban Dynamics and World Dynamics; exercises in model conceptualization. *Prep. 5.906, Principles of Dynamic Systems I.*

5.909 Systems Engineering and Analysis

Principles of systems modeling using a transfer function approach; transient response and sensitivity of open and closed-loop systems; stability analysis; frequency response. Emphasis is on the most recent time-domain analysis methods using state-transition diagrams, and solving by computer using readily available computer algorithms. *Prep. Bachelor of Science degree in Engineering or Science.*

5.910 Analytical Techniques for Engineers

Linear algebra, transform techniques including Laplace transforms and z transform; systems of linear differential equations. *Prep. Bachelor of Science degree in Engineering or Science.*

5.911 Linear Programming

An in-depth development of the theory in formulating the linear programming model for solving the problems of resources allocation, blending of ingredients, cutting stock, and flow-network commonly found in industry; sensitivity analysis, duality theorem, fundamentals of integer programming. *Prep. 5.900 or 5.902, Basic Operations Research or equivalent and a course in linear algebra.*

5.912 Network Planning and Control

Applications of stochastic networks to project management, scheduling, inventory, reliability, quality-control and other industrial applications; review of PERT and its inadequacies, to the development of stochastic flow-graphs and networks; solving for the mean task times and variances using moment-generating functions; setting up the model for computer simulation using GERT. *Prep. 5.962, Statistics I (formerly Probability and Statistics III).*

5.913 Data Processing for Engineers

Open only to students who have not had a basic course or extensive experience in a compiler language. A study of digital computers and computer programming techniques as applied to management problems. The course will cover the basic characteristics and operation of computing equipment and peripheral devices. The FORTRAN language is presented in depth and will be utilized by the student for programming and running several projects on a computer. Other compiler languages will be described and compared to FORTRAN. A systems approach to the design, development, and implementation of computer programs for solving management problems will be emphasized. Examples will be studied from several management areas. *Prep. Bachelor of Science degree in Engineering or Science.*

5.914 Advanced Operations Research (4 q.h. credits)

Further study of quantitative techniques available to assist management in scientific decision-making, including Markov processes, utility theory, Bayesian statistics, and forecasting; case studies of real industrial problems. *Prep. 5.900, Basic Operations Research.*

5.916 Engineering Analysis Utilizing Data Processing

Application of computers and major high-level computer languages to the solution of engineering problems. FORTRAN and GPSS are employed in applications drawn from production and service-oriented industries to illustrate topics such as generation of random numbers, inventory simulation models, file search and sorting techniques, and root-finding algorithms. The standard software packages of SPSS and MPOS are introduced. *Prep. 5.913, Data Processing for Engineers; or equivalent.*

5.918 Advanced Topics in Operations Research

Selected topics from the material covered in 5.914. *Prep. 5.901 and 5.902, Basic Operations Research I and II.*

5.919 Independent Study in Operations Research

Special topics in Operations Research by arrangement with a faculty member.

5.930 Basic Computer Systems Technology

Introduction to computer systems and assembly language programming using a language such as MIX. Topics include: machine language, assemblers and com-

pilars. Input/output device control. List processing, searching, and sorting; file systems and storage management. Students are required to prepare and test several programs. The emphasis is on basic concepts necessary to understand and evaluate technological development. *Prep. 5.913, Data Processing for Engineers.*

5.931 Compiler Design I (formerly Computer Systems)

An introduction to data structures including stacks and trees. The nature of compiling and interpreting, string manipulation and code generation. The writing of a compiler in assembly language of a BASIC-like source language will be started. *Prep. 5.930, Basic Computer Systems Technology, or consent of instructor.*

5.932 Compiler Design II (formerly Advanced Computer Systems)

The Compiler design work started in 5.931 is completed as a term project. *Prep. 5.931, Compiler Design I.*

5.933 Data Structures for Business Systems

Treats the topics of computer files, file organization and processing, list organization, file maintenance, and controls for quality, protection and security in the standard fashion (as opposed to integrated data base manipulations). Attention is given to cost benefit considerations for alternative techniques in a given area. *Prep. 5.940, Basic Information Systems Technology.*

5.934 Data Base Management

Introduction to data base systems and their rise in corporations. Review of basic data storage concepts. Evolution and growth of data bases. Data organization, file creation and management using hashing, threaded lists, tree structures. Distributed data bases. Data base software, directory maintenance, types of data base languages, query languages. Data base management systems. Data base administration. *Prep. 5.933, Data Base Structures of Business Systems, or equivalent.*

5.936 Simulation Methodology

Consideration of concepts in modeling, input data reduction, alternative programming languages for implementing models, model validation, efficiency in running simulations, and statistical reliability in the design and analysis of simulation experiments. Topics covered include: alternative approaches for simulation model control and their associated programming languages (e.g. SIMSCRIPT, GASP, and GPSS); parametric and nonparametric statistical techniques for reduction of empirical data to appropriate form for model input and validation; tactical planning issues such as selection of initial conditions, variance reduction techniques, and efficient generation of random variates; and design and analysis of experiments with underlying assumptions appropriate to the simulation process. Computer exercises illustrating the theoretical concepts will be drawn from production and service-oriented industries. *Prep. 5.935, Analysis with Simulation.*

5.940 Basic Information System Technology

Introduction to the hardware and software which support computer-based management information systems, design, development, and operation. Topics include basic computer concepts such as binary number systems, and CPU instruction cycle; data conversion and data entry devices; secondary memory types; output and display devices; and the nature of machine-oriented and high-level computer languages. Ob-

jective of the course is to provide sufficient knowledge regarding these concepts and equipment characteristics to permit specification of software and equipment configuration appropriate to support a given set of management information needs. *Prep. Bachelor of Science degree in Engineering or Science.*

5.941 Management Information Systems

The development of a conceptual framework which emphasizes support to management decision making. Relevant cognitive and organizational characteristics of human decision making are integrated into a systems analysis approach to development of effective information systems. Case studies discussions are used extensively to apply principles to realistic situations.

5.942 Management Information Systems: Planning and Controlling MIS Development

Phases of MIS design and development are examined from a planning and control viewpoint. Techniques are presented for conceptual identification of a continuing stream of information system candidate projects, for achieving a user-oriented assessment of cost/benefit potential, and for control of the design and implementation effort. Case study discussions are used extensively to apply principles to realistic situations.

5.943 Centralized vs. Distributed Data Processing

Develops the trade-offs in performance between centralized systems utilizing large-scale hardware installations and distributed systems utilizing minicomputers. Trade-offs are in terms of MIS performance capabilities, software development costs and lead times, management control, documentation and maintenance times and cost. Discussion of hardware is at the conceptual level of data flow and processing performance. *Prep. 5.940, Basic Information System Technology.*

5.944 Computerized Financial and Inventory Control Systems

Considers on-line systems for financial and inventory control from the technological, legal, and social point of view. The focus of the course is on electronic funds transfer (EFT) and point of sale (POS) terminals and associated computing equipment for inter-bank and consumer banking transactions, debit card transactions, and retail management information systems to control cash and inventory. The current technological status of EFT and POS terminals is discussed, including computing equipment and data communications systems, system development time and cost, and data base security precautions. A significant portion of the course attempts to establish a prognosis for the use of EFT and POS terminals by assessing the opinions of principal figures and organizations in banking and retail, sometimes using guest lecturers. *Prep. 5.940, Basic Information System Technology.*

5.953 Statistical Decision Theory

Use of Bayesian statistical inference to arrive at decisions when stochastic variables are interacting; relationship to game theory; decision making over time in a sequence; important expected values and distributions; relationship of Bayesian decision theory to classical statistical inference. *Prep. 5.962, Statistics I (formerly Probability and Statistics III), or equivalent.*

5.954 Advanced Quality Control

Mathematical methods of quality control; development of the process control charts for sampling by variables and by attributes; development of acceptance test procedures; development of life-testing plans; cost aspects of quality-control decisions. *Prep. 5.962, Statistics I (formerly Probability and Statistics III).*

5.955 Reliability Theory in Design (formerly Mathematical Theory of Reliability)

An introduction to the mathematical theory of the reliability of non-maintained systems and their application in the design of hardware and equipments in general; application of active and standby redundancy in systems; reliability predictions; stress-denoting techniques; availability concepts; design reviews and managerial control.

5.956 Reliability and Maintainability Assessment

Engineering graphical and mathematical methods for reducing reliability test and field data; development and application of reliability and maintainability demonstration test plans and the economic aspects of each plan; maintainability predictions; managerial decisions.

5.957 Reliability Analysis of Complex Systems

A Markovian-chain state-transition diagram approach to reliability modeling of non-maintained and maintained systems which permits analytic steady-state and dynamic solutions of both the stationary and non-stationary models; setting up the matrix-equations for solution by computer; controlling the numerical oscillations and accuracy of the results. *Prep. 5.955, Reliability Theory in Design (formerly Mathematical Theory of Reliability).*

5.960 Probability I (formerly Probability and Statistics I)

Fundamental concepts of probability. Events, event space, sample space, sampling. Axiomatic development events and the algebra of events. Counting, permutations, combinations. Discrete and continuous random variables. Density functions, mass functions, cumulative probability distributions. Expectation of random variables. Common discrete and continuous probability distributions including binomial, poisson, geometric, uniform, exponential and normal. *Prep. admission to program.*

5.961 Probability II (formerly Probability and Statistics II)

Continuation of 5.960. Multivariate probability distributions, marginal and conditional distribution. Expected value of functions of random variables, variance, covariance, and independence of random variables. Common multivariate distributions including the multinomial and the multivariate normal. Methods of determining the probability distributions of functions of random variables are discussed. *Prep. 5.960, Probability I (formerly Probability and Statistics I).*

5.962 Statistics I (formerly Probability and Statistics III)

Basic tools of statistical inference are covered. Limit theorems to include central limit, Chebyshevs Inequality, law of large numbers, point and interval estimators. Properties of estimators — bias, sufficiency, variance. Estimation by moments, max likelihood, Bayes. Hypothesis and hypothesis testing. One- and two-sided tests. Type I and Type II error. Power curve. *Prep. 5.961, Probability II (formerly Probability and Statistics II).*

5.963 Statistics II (formerly Statistics)

Extensions of topics covered in 5.962 to develop more complete statistical models for prediction and analysis of random phenomena. Topics include multiple regression analysis, correlation, design and analysis of simple experiments, and nonparametric tests such as goodness of fit and contingency tables. *Prep* 5.962, *Statistics I (formerly Probability and Statistics III)*.

5.964 Design of Experiments I

An introduction to the theory and application of experimental design techniques such as modeling and statistics can optimize resources and improve decision making risks. This course will cover experiments with single and multiple factors of interest and consider restrictions imposed by various experimental conditions. *Prep* 5.962, *Statistics I (formerly Probability and Statistics III)*, or equivalent.

5.965 Design of Experiments II

A continuation of topics from 5.964 including further design techniques to handle experiments with higher order experimental restrictions. Some additional analyses techniques will also be covered. *Prep* 5.964, *Design of Experiments I*, or equivalent.

5.966 Probability and Statistics (4 q.h. credits)

Same material as 5.960 and 5.961 but offered as a 4 q.h. course.

5.991 Thesis (Master's Degree) (6 q.h. credits)

Analytical and/or experimental work conducted under the auspices of the department. *Prep*. *Consent of adviser*.

5.992 Seminar in Industrial Engineering

Discussion and presentations of thesis related topics by students, presentations and discussions by faculty and eminent people in the field on timely industrial engineering topics. Field trips and visitations included where appropriate.

5.993 Special Project in Industrial Engineering (2 or 4 q.h. credits)

Individual work under faculty supervision. *Prep*. *Consent of adviser*.

5.994 Industrial Engineer Degree Project (10 q.h. credits)

Undertaken with the approval of the candidate's adviser and the Department Graduate Committee.

mathematics and physics

For mathematics and physics courses consult the bulletin of the Graduate School of Arts and Sciences.

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- Robert Najjar, B.A., M.B.A., *Bursar*
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Humberto Goncalves, *ex officio*
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Elaine G. Eliopoulos
Charles Ellis, Jr.
Stavros S. Frantzis
Robert E. Gilbert
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Victor B. Godin
Arthur M. Halpern
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Melvin Howards
Donald Jacobs
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Israel Katz
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Louise La Fontaine
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Holbrook Robinson
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Walter S. Jones

* Appointed by the President

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The Council determines broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the Council.

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Joseph Zelinski, *Vice Chairman*

Joan R. Lipson, *Secretary*

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Roland Goddu	Norman Rosenblatt
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Carl S. Christensen	Robert A. Parsons
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Thomas Kerr	Ruthann Stiles
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Bernard M. Goodwin, *Associate Professor of Chemical Engineering*

Thomas J. Kerr, *Assistant Director of the Graduate School of Engineering*

Melvin Mark, *Dean of Engineering*

David R. Freeman, *Professor of Industrial Engineering and Chairman of the Department*

J. Spencer Rochefort, *Professor of Electrical Engineering and Chairman of the Department*

John J. Cochrane, *Professor of Civil Engineering and Acting Chairman of the Department*

Charles Field, *Ex Officio, Professor of Co-operative Education*

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Northeastern University
214 Hayden Hall
360 Huntington Avenue
Boston, Massachusetts 02115

Northeastern
University
1978-80

GRADUATE

Graduate School of
Pharmacy and Allied
Health Professions

Northeastern University 1978-80

Graduate School of Pharmacy and Allied Health Professions



NEW ENGLAND
ASSOCIATION
OF SCHOOLS
AND COLLEGES
FOUNDED IN 1948

Northeastern University
Mugar Building
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone (617) 437-3211



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Academic and Service Buildings

African-American Institute
Barletta Natatorium
Boston YMCA
Botolph Building
Cabot Physical Education Center

Cabrera Hall
Churchill Hall
Cushing Hall
Dana Research Center
Dockser Hall
Dodge Library
Ell Student Center
Ell Student Center (Auditorium section)

Ell Student Center (Student Lounge section)
Forsyth Building
Forsyth Building Annex
Greenleaf Building
Hayden Hall
Hiller House
Hurting Hall
Kerr Hall (Faculty Center)

Knowles Center
Knowles Center (Gryzmish Hall)
Knowles Center (Volpe Hall)
11 Leon Street
15 Leon Street
Mugar Life Sciences Building (Peabody)

Health Professions Center
Parker Building
Peabody Center

Richards Hall
Robinson Hall
Stearns Center
United Realty Building

Residence Facilities

Boston YMCA
115 Hemenway Street
119 Hemenway Street
153 Hemenway Street
157 Hemenway Street
163 Hemenway Street

Kerr Hall
Light Hall
Melvin Hall
Rubenstein Hall

106-122 St. Stephen Street
Smith Hall
Speare Hall
Stetson Hall East
Stetson Hall West
White Hall

Map Code

13
G6
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G10

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Bldg Code

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NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS

SCALE 0 100 200

STREET DIRECTION →

PARKING ►

UNDERGROUND TUNNELS

ACADEMIC CALENDAR 1978—1979

Fall Quarter 1978

Registration period		
Burlington	Tuesday—Wednesday	Sept. 12—13
Boston	Monday—Thursday	Sept. 18—21
Classes begin	Monday	Sept. 25
Last day to drop a course	Wednesday	Nov. 22
Examination period	Monday—Saturday	Dec. 11—16

Winter Quarter 1978—79

Registration period		
Burlington	Tuesday	Nov. 28
Boston	Monday—Thursday	Dec. 4—7
Classes begin	Tuesday	Jan. 2
Last day to drop a course	Friday	Mar. 2
Examination period	Monday—Saturday	Mar. 19—24

Spring Quarter 1979

Registration period		
Burlington	Tuesday	Mar. 6
Boston	Monday—Thursday	Mar. 12—15
Classes begin	Monday	Apr. 2
Last day to file card for Spring Commencement	Friday	Mar. 30
Last day to pay fee for Spring Commencement	Tuesday	May 1
Last day to drop a course	Friday	June 1
Examination period	Monday—Saturday	June 11—16
Spring Commencement	Sunday	June 17

Summer Quarter 1979

Registration period		
Burlington	Monday—Tuesday	June 11—12
Boston	Wednesday—Thursday	June 13—14
Classes begin	Monday	June 25
Last day to file card for Fall Commencement	Friday	July 6
Last day to pay fee for Fall Commencement	Wednesday	Aug. 1
Examination period	Wednesday—Thursday	Aug. 1—2

UNIVERSITY HOLIDAYS 1978—79

Columbus Day	Monday	October 9
Veterans Day	Saturday	November 11
Thanksgiving Recess	Thursday—Saturday	November 23—25
Christmas Vacation	Monday—Monday	Dec. 18—Jan. 1
Martin Luther King Day	Monday	January 15
Washington's Birthday	Monday	February 19
Patriot's Day	Monday	April 16
Memorial Day	Monday	May 28
Independence Day	Wednesday	July 4
Labor Day	Monday	September 3

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. Radio stations WBZ, WEEI, WHDH, WJDA, WCOP, WRKO, WLYN, WKOX, WHAV, and WLLH will announce the University's decision to close.

In addition, the University maintains an emergency snow phone (262-SNOW). Whenever in doubt, call 262-SNOW and a taped message will indicate the status of classes.

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer and/or the Title IX coordinator.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

The Northeastern University catalog contains *current information* regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

We at Northeastern will do our best to make available to you the finest education we can provide, the most stimulating atmosphere in which to learn, and the most congenial conditions under which you may enjoy the learning experience. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. You will be a full participant in an educational partnership. We will and, indeed, can only make the opportunities available to you; it is up to you to take advantage of them.

This is equally true with your career upon graduation. We cannot guarantee that you will obtain any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state. While we will be ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because we cannot know what your expectations and understandings are unless you tell us.

In brief, what we are saying to you is that we are here to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.



the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The state legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of about 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses—offered by the University since 1906—and adult day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate School of Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degrees of Master of Education and Doctor of Education, and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs include seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intra-state lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The 50-acre campus is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering; Chemistry and Biology; Mathematics and Psychology; and Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 404,000 volumes supplemented by some 452,300 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 4,000 periodical titles, 100,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts, 12 miles from the main campus. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups.

the graduate school of pharmacy and allied health professions

In 1962 the College of Pharmacy was established at Northeastern University, and shortly thereafter the Graduate School of Pharmaceutical Sciences was formed and offered, on a full-time basis, Master of Science degree programs in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology. All these programs involved one year of planned cooperative work experience. In 1970 a full-time doctoral program, leading to the Ph.D. in Medicinal Chemistry, was instituted.

The necessity for making these Master of Science degree programs more relevant to the greater Boston community led to the establishment of part-time evening programs. In 1971 the Division of Allied Health Sciences joined with the College of Pharmacy to establish the new College of Pharmacy and Allied Health Professions. In 1972 two new part-time Master of Science degree programs were inaugurated, one in Medical Laboratory Science and the second in Clinical Chemistry, the latter being cosponsored by the Chemistry Department in the Graduate School of Arts and Sciences. In 1974 a Master of Science degree program in Radiopharmaceutical Science was established.

Currently the College offers the following graduate programs:

Master of Science

- Clinical Chemistry
- Hospital Pharmacy
- Medical Laboratory Science
- Medicinal Chemistry
- Pharmacology
- Radiopharmaceutical Science

Doctor of Philosophy

- Medicinal Chemistry

Interdisciplinary Doctor of Philosophy

with specialization in:

- Biopharmaceutics
- Clinical Chemistry
- Forensic Chemistry
- Medical Laboratory Science
- Pharmacology
- Radiopharmaceutical Science

GENERAL REGULATIONS

The general regulations that follow are minimal requirements shared by the several degree programs. The student is advised to consult the appropriate program for a statement of specific requirements.

Application

Applicants should address their inquiries to the Director of the Graduate School of Pharmacy and Allied Health Professions. Application forms and other pertinent information will then be mailed to them. Submission of the completed forms, together with all official transcripts and two letters of recommendation, is essential before potential students can be considered for admission to a specific degree program. Applicants whose native language is not English must take the Test of English as a Foreign Language and submit the results to the Director of the Graduate School of Pharmacy and Allied Health Professions. All necessary supporting documents must be on file at least four weeks before the date of registration for the quarter in which the student expects to begin a scholastic program. Consideration of applications received after this date may be delayed.

Applicants to the doctoral program who desire assistantships should apply no later than March 15. It may not be possible to give equal consideration to applications received after this date. Candidates for financial awards should so indicate in their letter of application. These awards are usually restricted to full-time doctoral students. Such applicants are strongly urged to take both the aptitude and advanced portions of the Graduate Record Examination. (See Doctoral Entrance Examination.)

Admission

To be enrolled for graduate work, an applicant must submit a complete official transcript indicating the award of a baccalaureate degree from a recognized institution. Applicants must also provide evidence of their ability to pursue creditably a program of graduate study in their chosen field. Scholastic records must therefore show academic distinction, and their undergraduate programs must show breadth as well as adequate preparation in the anticipated specialization. Acceptance to the school is granted upon recommendation of the Graduate Committee of Pharmacy and Allied Health Professions after a review of the completed application.

Foreign students who do not receive a graduate award or whose award is insufficient to cover all educational and living expenses must certify that they are able to meet all such expenses while at Northeastern. A visa may not be granted without such certification. Foreign students should note that many of the master's degree programs are part time and, therefore, students are not eligible for I-20 visas.

Student Classifications

Regular Students — Students accepted to a specific degree program.

Conditional Students — Students who have been accepted in the graduate school, but who are not formally matriculated in a degree program. Students in this category who wish to be admitted to a degree program must petition the Graduate Committee requesting a change in status. This request is to be made after the completion of 12 quarter hours of graduate credit. No more than 16 quarter hours may be transferred from the conditional student category to a degree program. In those instances where additional courses have been taken, only the first 16 quarter hours of credit will be accepted. Conditional students are expected to obtain a B average. All courses within this 16-quarter hour limitation will be transferred if the student is admitted to a degree program; included will be C, F, and I grades. It is the student's responsibility to request, in writing, a change of status.

Special Students — Students who are permitted to take a single course by obtaining permission from the course instructor as well as administrative approval from the Director of the Graduate School. This approval does not commit the Graduate School in any way regarding future admission of such a student as either a conditional or regular student.

Doctoral Students — Students admitted to a doctoral program.

Doctoral Degree Candidates — Doctoral students who have completed 40 quarter hours of acceptable graduate work and who have passed the qualifying examination.

Registration

Students must register within the dates and times listed on the school calendar. The place of registration is announced prior to each quarter.

Residence

All course work for advanced degrees must be registered for and completed at Northeastern University unless the Graduate Committee has granted approval of work taken elsewhere.

Programs of Study

The study load for full-time students is 8 quarter hours of course work or a combination of fewer credits, together with an independent research project. Students involved in such a project should work closely with their advisers to determine their individual course load assignments. Part-time students decide upon their course load after consulting with the director of their specific program. Courses in most fields are generally offered in the late afternoon and evening. Exceptions to this are posted with the quarterly list of course offerings.

Grading System

Performance of students in graduate courses is graded as follows:

A Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory

This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I Incomplete without quality designation.

This grade may be given to those students who fail to complete the work of the course.

L Audit without credit.

S Satisfactory without quality designation.

U Unsatisfactory without quality designation.

An S or U grade is used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first- and second-quarter sequence.

All graduate research courses will be graded on a pass/fail basis.

The I grade will be changed to a letter grade when the deficiency which led to it is made up to the satisfaction of, and in the manner prescribed by, the course instructor, or, in his absence, by the chairman of the department issuing the grade. The period for clearing such a grade is restricted to one calendar year from the date of its first recording on the student's permanent record.

Students must indicate their preference for auditing a course at registration. No credit is given for the course; however, it will appear on the student's transcript. Registration changes from an audit to a graded status, or vice versa, must be made prior to the second week of classes. The tuition fee for an audit course is the same as that for a graded course.

Class Hours and Credits

All courses are entered as quarter-hour credits. A quarter hour of credit is equivalent to three fourths of a semester-hour credit.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

Withdrawals

In order to withdraw from a course, a student must complete an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the first six weeks of the course or upon the receipt of a mid-term examination, whichever is later. Students are withdrawn on the date at which the official form is filed with the Registrar. Ceasing to attend class or notifying the instructor does not constitute official withdrawal.

Changes in Requirements

The continuing development of the Graduate School may force frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the current bulletin. Any deviation from this must be requested by petition to the Graduate Committee.

Application for the Diploma

A commencement card must be filed with the Registrar's Office on or before the applicable date listed in the calendar. For students failing to file, there is no assurance that the degree will be granted in that particular year, even though all other requirements have been fulfilled.

THE MASTER OF SCIENCE DEGREE

Admission

Specific requirements for each degree program are found in the appropriate paragraphs for each program, beginning on page 33.

Academic Requirements

A candidate for the master of science degree must complete a minimum of 40 quarter hours of correlated work of graduate caliber and other studies as may be required by the specific program.

During the first half of the total course work hours required for the degree, the candidate is expected to maintain a minimum quality-point average of 2.5. At completion of three fourths of the total course work hours required for the degree, the candidate is expected to have a quality-point average of 2.8. To qualify for the degree, he must obtain a final average of 3.0, equivalent to a grade of B. This average is calculated quarterly by the graduate school on the basis of A = 4, B = 3, C = 2, and F = 0, and excludes any transfer credits from outside the Graduate School of Pharmacy and Allied Health Professions. All required courses will be accepted on a graded basis.

Not more than four quarter hours (generally two courses) of repeated courses, additional courses, or permanent I's may be allowed in order to satisfy the degree requirements.

Within the above limitations, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated only once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

Obtaining a Second Master's Degree

Students who have completed an M.S. degree in the Graduate School of Pharmacy and Allied Health Professions and wish to obtain a second master's degree should petition to do so. Students will be required to complete all the requirements listed for the second program, taking a minimum of 16 additional quarter hours of graduate credit.

Transfer Credit

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree, provided that the credits transferred consist of A or B grades in graduate-level courses, are in the candidate's field, have been earned at a recognized institution, and have not been applied toward any other degree. Students should petition the Graduate Committee, in writing, for all transfer credit. Transfer credit grades may not be used in order to obtain the academic average necessary for completion of degree requirements.

Students changing majors within the College or University will receive transfer credit on a graded basis for ALL required courses taken in the desired new major. In addition a maximum of 12 quarter hours of credit for courses in the elective categories completed with the grades of A or B may be transferred. Transfer credit for elective courses may not be used in order to obtain the academic average necessary for completion of degree requirements.

Time Limitation

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the Committee of the Graduate School of Pharmacy and Allied Health Professions.

THE DOCTOR OF PHILOSOPHY DEGREE

The doctor of philosophy degree is awarded to candidates who show evidence of high attainment and research ability in their major field. The degree requirements are administered by the Graduate Committee. It is the responsibility of the Director of the Doctoral Program to certify to the Graduate Committee the completion of all requirements for each candidate.

Admission

The degree program in the Department of Medicinal Chemistry and Pharmacology has an established admission procedure for students starting doctoral work at Northeastern University. The Interdisciplinary Doctor of Philosophy also provides for specialization in the fields of Biopharmaceutics, Clinical Chemistry, Forensic Science, Medical Laboratory Science, Pharmacology, and Radiopharmaceutical Science.

Residence Requirements

Candidates for the doctor of philosophy degree must spend the equivalent of at least one academic year in residence at the University as full-time graduate students. The Graduate Committee specifies the method of satisfying the residence requirement.

Doctoral Entrance Examination

Entrance requirements will be determined by the Graduate Committee and usually include an entrance examination. All doctoral applicants have the option of taking one of the following:

- a. The ACS Graduate Level Placement Examination
- b. The Graduate Record Examination
 - i. General
 - ii. Advanced in chemistry, biology or physics
- c. Medical College Aptitude Test (MCAT)

A student must select either (a), (b) or (c) prior to admission to the Ph.D. program. Those students planning to specialize in Medicinal Chemistry are urged to take option (a). It will not be possible for a student to take the ACS exam, fail and then choose to take the GRE exams or vice versa. A satisfactory grade for both of the examinations will be established by the Director of the Ph.D. program in consultation with the Director of the Graduate School and the Graduate Committee.

At its discretion, the Graduate Committee may drop a student from the doctoral program if the results of the doctoral entrance examination reveal deficiencies too great to be removed within one year.

Qualifying Examination

A qualifying examination is prepared by members of the department and given twice each academic year. It is expected that a student will take this examination within two years from the date of the doctoral entrance examination. The purpose of the qualifying examination is to test the students' knowledge and skills in medicinal chemistry and especially their knowledge of recent developments in this field.

This examination is composed of two parts:

1. A written examination which will consist of two parts: Part A will emphasize specific course work of the candidate and shall consist of Medicinal Chemistry/Pharmacology (approximately one-third);

Biochemistry (approximately one-third); and Organic Chemistry (approximately one-third).

Part B will emphasize the candidate's specific area of interest, i.e., Biopharmaceutics, Clinical Chemistry, Medical Laboratory Science, Pharmacology, or Radiopharmaceutical Science. Part A and Part B must be passed on an individual basis.

2. An oral examination, given approximately two weeks after completion of part 1. The oral examination committee consists of the dissertation adviser (selection discussed below), two other members of the Department of Medicinal Chemistry and Pharmacology, and one member of the University from outside the department selected by the Director of the Graduate School. The student must pass the written portion before taking the oral examination at the scheduled time. Students failing the written part of the qualifying examination are given one opportunity to remove this failure by a make-up examination. Similarly, students have one additional opportunity to pass the oral examination. Students must make up any failure at the first opportunity. Those failing either portion of this examination twice are dropped from the program. A student who passes the qualifying examination and completes 40 quarter hours of graduate work with a 3.0 average is designated a Doctoral Degree Candidate.

Course Requirements

The minimum course requirement of 40 quarter hours of credit constitutes the work normally required for the master's degree. The course requirements beyond this total for the Ph.D. degree will depend upon the needs and interests of the individual.

Transfer Credit

If transfer credit for doctoral work is desired, approval of such credit must be given by the Director of the Ph.D. program. A maximum of 12 quarter hours of graduate credit obtained at a recognized institution is accepted, provided that the credits transferred are in the candidate's field, consist of work taken at a graduate level for graduate credit, and carry grades of A or B. Students should petition the Director of the Graduate School of Pharmacy and Allied Health Professions in writing for all transfer credit.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and which makes an original contribution to the field. This work should give evidence of the candidate's ability to conduct independent investigation and to interpret the results of his research in an acceptable manner.

Selection of a thesis adviser must be made within four months of the student's completion of the entrance examinations. An adviser is selected

by mutual consent of the student and a member of the faculty in the Department of Medicinal Chemistry and Pharmacology. It is expected that students will begin their research and demonstrate satisfactory proficiency in the laboratory prior to the qualifying examination.

The thesis adviser serves as Chairman of the Thesis Committee, which consists of not less than three members. Individuals are chosen for expertise in the student's area of research. The student's research progress is evaluated by this Committee, meeting no less than twice a year. Low productivity or unsatisfactory work provides the basis for warning by this Committee. Two such warnings result in a student's dismissal from the program at any stage.

Foreign Language

A reading knowledge of one foreign language, such as French, German, or Russian, is required. The Thesis Committee prescribes the manner in which proficiency in the language is determined. With the approval of the Graduate Program Director and the Thesis Committee, an appropriate course in computer science or advanced biometrics may be substituted for the foreign language requirement.

Research Proposal Defense

After completion of the qualifying examination, and prior to the final oral examination, the students, with the approval of the Thesis Committee, prepare a written proposal in an area distinctly different from their theses. The student then defends it orally before this Committee.

Final Oral Examination

The final oral examination is taken after the completion of all other requirements for the degree. This examination must be held at least three weeks before the commencement at which the degree is to be awarded.

The Thesis Committee conducts the final oral examination. The Director of the Graduate School of Pharmacy and Allied Health Professions, together with the Department Chairman and the thesis adviser, appoints any additional members to this Committee which they consider necessary.

The final oral examination deals with the subject matter of the doctoral dissertation, significant developments in the field of the dissertation, and the students' background knowledge in their field of specialization.

Time Limitation

After the establishment of degree candidacy, a maximum of five years is allowed for completion of the degree requirements.

Registration

All students must register in the Registrar's Office for course work or dissertation as approved by the faculty adviser. Students must be registered for the dissertation during the quarter in which they take the final oral examination.

Curriculum Design

The graduate school recognizes the divergent backgrounds and goals for individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objective.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more graduate departments or schools within the University. To meet this need, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but which does not agree exactly with the individual graduate school regulations.

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out, written proposal describing the areas of projected study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the Director of the Graduate School, who will then forward it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by the Graduate Committee of the Graduate School of Pharmacy and Allied Health Professions.

Formation of Interdisciplinary Committee

Students who have been accepted for interdisciplinary study must obtain the consent of an adviser who will direct their doctoral dissertation. This adviser, who may or may not be a member of the sponsoring department, serves as Chairman of the Interdisciplinary Committee for a specific student. A second member is appointed from the sponsoring department by the director of the doctoral program. These two members will select one or more additional members. At least two departments must be represented on the committee, and a majority of the committee members must come from doctoral degree-granting departments. The chairman of the sponsoring department notifies, as soon as possible, the Director of the Graduate School of Pharmacy and Allied Health Professions regarding the committee membership.

Duties of Interdisciplinary Committee

A member of the Interdisciplinary Committee, who is also a member of the sponsoring department, serves as the registration officer to approve the

student's course registration. A copy of the approved course registration must also be filed with the other committee members and with the Graduate Committee.

The Interdisciplinary Committee is responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This Committee must also certify to the sponsoring department the completion of the requirements for the doctoral degree.

The Interdisciplinary Committee must be assured that the student's program represents standards comparable to those of the sponsoring department and that the program is not so broad that it has inadequate depth in any area. The Director of the Graduate School may review the program at any time to determine whether its objectives are being met.



financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates are subject to revision by the Board of Trustees and may change year by year. The current rate is stated in a covering letter for the specific year and program.

Doctoral candidates actively utilizing the resources of the University in their Ph.D. dissertation are charged an additional \$600 per quarter. Those doctoral candidates registered for dissertation work performed off campus are charged \$200 in addition to tuition charges each quarter, and those doctoral candidates who are no longer actively utilizing University resources are charged a continuation fee of \$50 per quarter.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University.

Fees

All students are charged an application fee of \$15 when they apply for the first time to a graduate school at Northeastern University.

Other fees include a charge of \$10 for late payment of tuition and a fee of \$25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. For teaching assistants and research fellows, the fee is \$6.25 per quarter. All part-time students on the Huntington Avenue Campus are charged 75 cents per quarter.

All full-time students pay a nonrefundable University Health Services fee of \$140 each year. This fee is waived for Full Tuition Scholarship recipients. A separate brochure from the Health Services gives details of the plan. Tuition and fees are subject to change without notice.

All financial obligations to the University must be discharged prior to graduation.

Refunds

Tuition refunds are granted only on the basis of the date appearing on the student's official withdrawal form. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be directed to the Bursar's Office.

Refunds are granted in accordance with the following schedule:

Official Withdrawal Filed Within:	Percentage of Tuition:
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

The Office of Financial Aid offers several types of assistance to graduate students. All awards are based on financial need. Since the majority of these awards is sponsored by the federal government, the amount of aid granted is dependent upon the amount of funds allocated to Northeastern University each year.

Only students who have been officially accepted as degree candidates may apply for financial aid. In addition, the University only awards financial aid to students who are U.S. citizens and permanent residents of the United States. Students who are studying in the United States on student visas are not eligible for federal assistance.

Northeastern University is a participant in the Graduate and Professional School Financial Aid Service (GAPSFAS). All applicants must file a GAPSFAS in order to be considered for financial aid. All sections of the GAPSFAS, including the parents' section, must be completed and sent to the GAPSFAS, Box 2614, Princeton, New Jersey 08540. Northeastern University also requires a Graduate Student Application. These forms may be obtained in the Office of Financial Aid, 254 Richards Hall.

The following types of assistance are administered by the Office of Financial Aid:

National Direct Student Loan

This program is available to full-time graduate students who *need* a loan to meet their educational costs. Graduate students may borrow up to \$10,000 under this program. Repayment and interest do not begin until nine months after the student ceases to carry at least a half-time academic load at any institution of higher education. Repayment may be extended over a ten-year period with an interest rate of three percent per annum. No payments are required for up to three years while a borrower is serving in the Armed Forces, Peace Corps, or VISTA. Cancellation provisions are available for borrowers who work in certain fields of teaching or specified military duty.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least *one-half* the normal academic load, may borrow from a participating bank or other financial institution. Terms and conditions of

these loans vary from state to state. New federal regulations affecting this program were signed into law on October 12, 1976 (S.2657). In some states, full-time graduate students may borrow up to \$5,000 per academic year. Loan recommendations are based on financial need. Students eligible for federal interest benefits are not subject to interest payments until nine months after they cease to carry at least a half-time academic load. Repayment may be extended for as long as ten years with an interest rate of seven per cent per annum. No payments are required for up to three years while a borrower is serving in the Armed Forces, Peace Corps, or VISTA. Information and applications are available from banks, State Guarantee agencies, and regional offices of the U.S. Office of Education. Massachusetts residents may contact the Office of Financial Aid for the necessary applications.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr., awards are made as openings occur to qualified minority graduate students who show financial need and are accepted to full-time study in the graduate schools of the University. Stipends will cover tuition and all fees. Applications for Martin Luther King Scholarships are available at the African-American Institute, 40 Leon Street, 617-437-3141.

Fellowships and Assistantships

Northeastern University offers a limited number of fellowships and assistantships for full-time students who are working toward the doctor's degree. They may establish candidacy for these awards by completing the relevant section of the application for admission. Students already enrolled should consult their departmental adviser. There is no financial aid available for the Master of Science programs or for those students enrolled in the Special Student category. Those individuals auditing any course must remit full tuition.

The University does not award financial assistance in any form to students who are not citizens or permanent residents of the United States.

Tuition Scholarships

Each of the graduate awards provides a full-tuition scholarship for the academic quarter(s) in which the appointment is made. Assistants receive stipends for performing departmental work. Duties vary, depending on departmental needs which include the following:

Teaching Assistants: Assist in instruction, laboratory supervision, correcting papers, and proctoring examinations. Assigned duties require approximately 18-20 hours per week.

Research Assistants: Work in instructional departments or other University offices doing research which is not used for a master's or doctor's thesis. Duties assigned require 18-20 hours per week.

Administrative Assistants: Perform administrative duties in instructional and noninstructional offices. Assigned duties require 18-20 hours per week.

Physical Examination

All students receiving graduate awards must have a record of a physical examination filed with Health Services. When students receive an award for the first time, information concerning this requirement is sent to them by Health Services.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of three academic quarters and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty adviser and the Director of the Graduate School.

Acceptance Conditions

Northeastern University, which is a member of the Council of Graduate Schools of the United States, subscribes to the following resolution of the Council:

Acceptance of an offer of financial aid (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by an actual or prospective graduate student completes an agreement which both student and graduate school expect to honor. In those instances in which the student accepts the offer before April 15 and subsequently desires to withdraw, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer.

HOUSING

Although no dormitory facilities exist for graduate students, housing information is provided through the Office of University Housing. A few Dormitory Proctorships, providing room and board, are available through the Student Housing Office.

faculty

GRADUATE FACULTY

Professors

- Arnold S. Goldstein, B.S. in Pharmacy, J.D., *Professor of Pharmacy Administration*
- O. James Inashima, Ph.D., *Professor of Pharmacology and Pharmacy*
- Barry L. Karger, Ph.D., *Professor of Chemistry and Medicinal Chemistry and Director of the Institute of Chemical Analysis, Applications, and Forensic Science*
- Philip W. LeQuesne, Ph.D., *Professor of Chemistry and Medicinal Chemistry*
- John L. Neumeyer, Ph.D., *Professor of Medicinal Chemistry and Chemistry, Acting Director of the Graduate School of Pharmacy and Allied Health Professions*
- Robert F. Raffauf, Ph.D., *Professor of Pharmacognosy, Medicinal Chemistry, and Chemistry*
- Gerald E. Schumacher, Pharm.D., M.Sc., Ph.D., *Professor of Pharmacy; Dean of College of Pharmacy and Allied Health Professions*
- Elliot Spector, Ph.D., *Professor of Pharmacology*
- John W. Webb, M.S., *Clinical Professor of Pharmacy*

Associate Professors

- Judith Barr, M.Ed., MT (ASCP), *Associate Professor of Medical Laboratory Science*
- Roger W. Giese, Ph.D., *Associate Professor of Clinical Chemistry*
- William A. Gouveia, M.S., *Clinical Associate Professor of Pharmacy*
- James J. Gozzo, Ph.D., *Associate Professor of Health Science*
- Britta L. Karlsson, M.S., M.T. (ASCP), *Associate Professor of Medical Laboratory Science*
- Donald S. Kosersky, Ph.D., *Associate Professor of Pharmacology*
- Richard T. Scheife, Pharm.D., *Clinical Associate Professor of Pharmacy*
- Leon D. Shargel, Ph.D., *Associate Professor of Pharmacy and Pharmacology*
- Albert H. Taubman, Ph.D., *Associate Professor of Pharmacy Administration; Chairman, Department of Pharmacy*
- Paul Vouros, Ph.D., *Associate Professor of the Institute of Chemical Analysis, Applications and Forensic Chemistry*
- Victor D. Warner, Ph.D., *Associate Professor of Medicinal Chemistry; Chairman, Department of Medicinal Chemistry and Pharmacology*

Assistant Professors

- Jeffrey B. Blumberg, Ph.D., *Assistant Professor of Pharmacology*
- Norman R. Boisse, Ph.D., *Assistant Professor of Pharmacology and Physiology*

Gerald L. Davis, Ph.D., MT (ASCP), *Assistant Professor of Medical Laboratory Science*

Richard C. Deth, Ph.D., *Assistant Professor of Pharmacology*

Robert N. Hanson, Ph.D., *Assistant Professor of Medicinal Chemistry*

Clifford E. Hotte, Pharm.D., Ph.D., *Assistant Professor of Pharmacy*

Bynum M. Jackson, Ph.D., M.T.(ASCP), *Assistant Professor of Medical Laboratory Science*

Jerome P. Janousek, M.S., *Clinical Assistant Professor of Pharmacy*

Alun G. Jones, Ph.D., *Clinical Assistant Professor of Medicinal Chemistry*

Alan F. Kaul, M.S., *Clinical Assistant Professor*

Simon H. Kuttub, Ph.D., *Assistant Professor of Medicinal Chemistry*

Arnold Marglin, M.D., Ph.D., *Clinical Assistant Professor of Health Science*

Carol D. Meyer, Ph.D., *Assistant Professor of Bioinorganic Chemistry*

B. Susan Rogers, M.S., M.T. (ASCP), *Assistant Professor of Medical Laboratory Science*

Joseph M. Sceppa, M.S., *Clinical Assistant Professor of Pharmacy*

Bruce Weiner, M.S., *Clinical Assistant Professor*

Andrew B. C. Yu, Ph.D., *Assistant Professor of Pharmacy*

Adjunct Faculty

Yogendra Bhatnagar, Ph.D., *Lecturer*

Edward A. Carter, D.Sc., *Lecturer*

Philip D. Cobb, M.P.H., *Lecturer*

Michael A. Davis, Sc.D., *Adjunct Professor of Radiopharmaceutical Science*

Theodore G. Gabig, M.D., *Lecturer*

Michael H. Gay, Ph.D., *Instructor*

Felix E. Granchelli, Ph.D., *Lecturer*

John F. Howes, Ph.D., *Lecturer*

William D. Kaplan, M.D., *Lecturer*

Agnes Kim, M.D., *Special Lecturer in Clinical Laboratory Science*

George M. Krause, M.S., *Adjunct Professor of Pharmacy*

Manlio A. LoConte, M.D., *Lecturer*

Frank Moy, M.S.E.M., *Lecturer*

Andre Rosowsky, Ph.D., *Adjunct Associate Professor of Medicinal Chemistry*

Paul Smith, M.S., *Lecturer*

Stanley L. Twomey, Ph.D., *Lecturer*

ADMINISTRATIVE POSITIONS

Gerald E. Schumacher, *Dean of College of Pharmacy and Allied Health Professions*

John L. Neumeyer, *Acting Director of the Graduate School of Pharmacy and Allied Health Professions; Director of the Doctor of Philosophy*

Degree Program in Medicinal Chemistry

Carol M. Konis, *Administrative Assistant*

Michael A. Davis, *Director of the Master of Science Degree Program in Radiopharmaceutical Science*

Roger W. Giese, *Director of the Master of Science Degree Program in Clinical Chemistry*

James J. Gozzo, *Director of the Master of Science Degree Program in Medical Laboratory Science*

Donald S. Kosersky, *Director of the Master of Science Degree Program in Pharmacology*

Robert F. Raffauf, *Director of the Master of Science Degree Program in Medicinal Chemistry*

John W. Webb, *Director of the Master of Science Degree Program in Hospital Pharmacy*



fields of study

The sections that follow list degree programs and courses available to a student during the typical period of attendance required to obtain each degree. The place and time for which a specific course is offered may be found in the course announcement made available in May for the summer quarter and in June for the following academic year.

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN CLINICAL CHEMISTRY

Objectives

At the present time, there is an acute shortage of trained people in clinical chemistry. This is especially critical in view of the increasing need for individuals with in-depth training in the chemical and biological sciences to direct clinical laboratory personnel.

Northeastern offers a part-time, evening Master of Science degree program in Clinical Chemistry under the joint sponsorship of the Department of Chemistry and the Graduate School of Pharmacy and Allied Health Professions. The program is available to people currently practicing clinical chemistry or those with appropriate backgrounds who wish to train for this field.

The development of this program came about through careful deliberation by members of the Departments of Chemistry, Medicinal Chemistry and Pharmacology, and Medical Laboratory Science. It is a truly interdisciplinary offering, representing a composite of the skills and knowledge of each of these disciplines. It is one of a series of graduate programs designed to meet the frequently expressed needs of clinical personnel.

Admission and Program Features

The Clinical Chemistry Academic Standing Committee also serves as the Admissions Committee for this program and is composed of three faculty members: two from the Department of Medicinal Chemistry and Pharmacology, and a third from Medical Laboratory Science. The Committee evaluates the background of the applicants, suggests course sequences, and informs the students of those offerings which will maximize their background in clinical chemistry.

For admission to this part-time M.S. degree program, the applicant must have completed a baccalaureate program in biology, chemistry, medical technology, pharmacy or a related field. Undergraduate requirements are: a minimum of one year of organic chemistry, one year of analytical chemistry, each with a laboratory or its equivalent, one year of human

physiology, and one year of physical chemistry. An individual who has deficiencies in any of these areas may take appropriate courses at Northeastern University concurrently with those graduate courses which do not require the deficient prerequisites. The appropriate evening courses offered at University College of Northeastern University are: Analytical Chemistry, 12.421 - 12.423 or 12.427; Organic Chemistry, 12.431 - 12.433; Physical Chemistry, 12.441 - 12.443; and Human Anatomy and Physiology, 18.424 - 18.426. Equivalent courses are accepted from this University or other accredited universities. Students admitted with deficiencies must remove them during the first 12 quarter hours of graduate work. By the completion of the degree requirements, students must have at least one year of acceptable clinical laboratory experience subsequent to attaining the appropriate baccalaureate degree.

Students in good standing in the program who lack this experience requirement may apply for the course 87.167 Clinical Chemistry Applied Study (carries 5 q.h. of undergraduate credit, 2 q.h. of which may be applied toward the master's degree). This course is offered through the Graduate School of Pharmacy and Allied Health Professions of Northeastern University at one of the nearby affiliated hospitals and provides three months of this experience requirement. Individuals who have completed this course may achieve an enhanced opportunity to obtain subsequent employment in this field and thereby satisfy the one-year experience requirement.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. It is anticipated that students may complete the degree requirements in a minimum of three years; however, the duration may sometimes be increased or decreased to satisfy the particular needs and requirements of the student. No research report or thesis is required.

Curriculum

<i>Required Courses</i>	<i>Credits</i>
10.8H3 Biostatistics	2
12.821 Analytical Separations	2
12.823 Optical Methods of Analysis I	2
72.834 Advanced Clinical Chemistry I	2
72.835 Advanced Clinical Chemistry II	2
72.837 Seminar and Report in Clinical Chemistry I	2
73.845 Radioisotopes in Biological Systems	2
87.810 Functions of the Human Systems	2
90.821 Biochemistry I	2
90.822 Biochemistry II	2
90.823 Biochemistry III	<u>2</u>
QUARTER HOURS	22

*Elective Core**Credits*

A minimum of 12 credits must be taken from the following list:

12.811	Electroanalytical Chemistry I	2
12.824	Special Topics in Analytical Chemistry I	2
12.825	Special Topics in Analytical Chemistry II	2
12.829	Computers in Chemistry	3
72.825	Special Topics in Clinical Chemistry	2
72.838	Seminar and Report in Clinical Chemistry II	2
72.839	Seminar and Report in Clinical Chemistry III	2
72.861	Advanced Medicinal Chemistry I	2
72.862	Advanced Medicinal Chemistry II	2
72.863	Advanced Medicinal Chemistry III	2
72.864	Advanced Medicinal Chemistry IV	2
72.865	Special Topics in Medicinal Chemistry	2
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.820	Environmental Toxicology	2
73.844	Drug Metabolism	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
87.833	Immunobiology	2
87.890	Seminar	1
90.824	Applications of Mass Spectrometry	2

Elective Courses

Taken with the approval of the Director of the M.S. program in Clinical Chemistry and the course instructor. Selection may be made from the above courses, as well as from the following and other appropriate graduate courses in the Graduate School of Pharmacy and Allied Health Professions or in the rest of the University.

Credits

11.871	Radiation Physics	2
11.872	Radiobiology	2
12.841	Inorganic Chemistry I	2
12.842	Inorganic Chemistry II	2
12.846	Coordination Chemistry	2
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Physical Organic Chemistry	2
12.866	Spectrometric Identification of Compounds	2
12.881	Chemical Thermodynamics I	2
12.885	Introductory Quantum Chemistry	2
12.893	Chemical Kinetics	2
18.245	Serology-Immunology	3

MASTER OF SCIENCE IN CLINICAL CHEMISTRY
(Required Courses and Possible Electives)

Summer Quarter
90.824 Applications of Mass Spectrometry

18.840	Comparative Physiology of Regulatory Mechanisms	2
18.842	Vertebrate Endocrinology	2
18.843	Procedures in Endocrinology	3
18.860	Cell Biophysics and Biochemistry	5
18.909	Animal Virology	4
18.940	Microbial Biochemistry	4
72.815	Nuclear Medicine I	2
72.816	Nuclear Medicine II	2
72.817	Nuclear Medicine III	2
72.818	Nuclear Medicine IV	2
72.825	Special Topics in Clinical Chemistry	2
72.844	Seminar and Research Report in Radiopharmaceutical Science	2
72.866	Phytochemistry	2
72.880	Cardiovascular Drugs	2
73.818	Special Topics in Pharmacology	2

A minimum total of 40 quarter hours of graduate credit is necessary for completion of the M.S. degree in Clinical Chemistry.

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN HOSPITAL PHARMACY

Objectives

Institutional pharmacy constitutes a major area of professional practice. The pharmacist practicing in this environment must show proficiency in both the administrative and therapeutic disciplines. The administrative need is essential, since the director of a hospital pharmacy must have managerial competence in order to direct personnel, determine budgets, interact with hospital administration and other departments, and establish guidelines and objectives for the pharmacy. It is the responsibility of the pharmacist to determine the goals and the means for integrating the pharmacy into a high-quality health delivery system.

Additionally, a pharmacy director must be knowledgeable of the most modern therapeutic measures, especially as they relate to the preparation and use of drugs. This is the pharmacist's area of expertise. The physician, nurse, and other medical personnel depend upon the modern pharmacist to counsel them in drug usage and selection, contraindication of drugs with specific disease conditions, and problems encountered with drug interactions. The pharmacist's guidance is essential and can only be based upon a comprehensive knowledge of therapeutics.

This program allows the modern pharmacist to prepare himself for such a career in institutional practice.

Admission and Program Features

The Director of the M.S. program in Hospital Pharmacy serves as Chairman of the Hospital Pharmacy Academic Standing Committee. The function of this Committee is to evaluate the background of the applicants and advise the Graduate Committee of their suitability for admission to the program. Additionally, the Director guides the graduate students in course selection and apprises them of those offerings which maximize their individual educational goals.

Admission as a matriculated graduate student is limited to those who possess a B.S. degree in Pharmacy (or an equivalent degree in Pharmacy) from an accredited college of pharmacy. The candidate must have demonstrated an ability to pursue graduate studies as evidenced by undergraduate transcripts and/or other evidence of scholarship. In addition, a sufficient background in biopharmaceutics and pharmacokinetics, as demonstrated by a challenge exam or other means, will be required of all students.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring and summer quarters. It is anticipated that students may complete the degree requirements in a minimum of three years; however, the duration may in some cases be increased or decreased to satisfy the particular needs and requirements of the student. A thesis option is available but is not required. Thesis courses are graded on a pass/fail basis.

Curriculum

The program contains a core curriculum of 10 quarter-hour credits of required courses and 12 quarter-hour credits to be selected from an elective core consisting of six hours of administrative courses and six hours of therapeutic courses. The total of the required and elective core components is 22 quarter hours of credit. In addition, 18 hours are to be selected from those graduate courses offered by divisions in the University. These latter courses are to be selected with the guidance of the Director of the M.S. program in Hospital Pharmacy.

<i>Required Courses</i>		<i>Credits</i>
71.822	Seminar in Hospital Pharmacy	2
71.844	Hospital Pharmacy Administration I	2
71.845	Hospital Pharmacy Administration II	2
71.846	Hospital Pharmacy Administration III	2
71.854	Clinical Pharmacy	<u>2</u>
QUARTER HOURS		10

SAMPLE PROGRAM

MASTER OF SCIENCE IN HOSPITAL PHARMACY

YEAR 1

<i>Fall Quarter</i>		<i>Winter Quarter</i>		<i>Spring Quarter</i>	
71.844	Hospital Pharmacy Administration I	71.845	Hospital Pharmacy Administration II	71.846	Hospital Pharmacy Administration III
71.854	Clinical Pharmacy	71.858	Contemporary Therapeutics I	71.859	Contemporary Therapeutics II

<i>Summer Quarter</i>	
71.822	Seminar in Hospital Pharmacy

YEAR 2

<i>Fall Quarter</i>		<i>Winter Quarter</i>		<i>Spring Quarter</i>	
71.852	Health Care Administration I	71.853	Health Care Administration II	71.855	Human Relations in Health Care
71.860	Drug Monitoring	71.861	Sterile Products	71.862	Hospital Preparations

YEAR 3

<i>Fall Quarter</i>		<i>Winter Quarter</i>		<i>Spring Quarter</i>	
71.823	Legal Aspects/Federal Legislation in Pharmacy Elective	71.856	Information Science in Hospital Pharmacy Electives		Electives

ELECTIVES

<i>Fall Quarter</i>		<i>Winter Quarter</i>		<i>Spring Quarter</i>	
5.860	Health Care Organization and Management	39.9H1	Economics of Medical Care and Health Manpower	10.8H3	Biostatistics
10.8H3	Biostatistics	72.835	Advanced Clinical Chemistry II	71.816	Clinical Pharmacokinetics
41.816	Management Control of Health Service Systems	73.815	Concepts in Pharmacology II	73.820	Environmental Toxicology
72.834	Advanced Clinical Chemistry I	73.816	Concepts in Toxicology I	73.845	Radioisotopes in Biological Systems
63.814	Grantsmanship	73.844	Drug Metabolism	87.812	Pathophysiology II
73.814	Concepts in Pharmacology I	87.811	Pathophysiology I		

<i>Summer Quarter</i>	
5.913	Data Processing
45.838	Policy Formation in Health Care

Elective Core

Administrative Core

71.823	Legal Aspects/Federal Legislation in Pharmacy	2
71.852	Health Care Administration I	2
71.853	Health Care Administration II	2
71.855	Human Relations in Health Care	2
71.856	Information Science in Hospital Pharmacy	2
	QUARTER HOURS	6

Therapeutic Courses

71.858	Contemporary Therapeutics I	2
71.859	Contemporary Therapeutics II	2
71.860	Drug Monitoring	2
71.861	Sterile Products	2
71.862	Hospital Preparations	2
	QUARTER HOURS	6

Total Required Courses and Elective Core	22
Electives	18
TOTAL PROGRAM (<i>quarter hours</i>):	40

*Elective Courses**Credits*

10.8H3	Biostatistics	2
71.904	Hospital Pharmacy Thesis	2-8
72.834	Advanced Clinical Chemistry I	2
72.835	Advanced Clinical Chemistry II	2
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.820	Environmental Toxicology	2
73.844	Drug Metabolism	2
73.845	Radioisotopes in Biological Systems	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2

A maximum of 10 quarter hours of credit may be taken from the following courses:

	<i>Credits</i>
5.860 Health Care Organization and Management	2
5.913 Data Processing	2
21.840 Sociology of Medicine	3
21.850 Sociology of Occupations and Professions	3
22.868 Politics of Health Care Administration	3
39.9H1 Economics of Medical Care and Health Manpower	3

41.811	Financial and Managerial Accounting	3
41.816	Management Control of Health Service Systems	3
43.814	Consumer Behavior	3
45.811	Purchasing and Materials Management	3
45.815	Behavioral Concepts	3
45.816	Organizational Behavior I	3
45.817	Organizational Behavior II	3
45.824	Organizational Behavior in a Nonprofit Environment	3
45.833	Operations Management in the Health Care System	3
45.838	Policy Formation in Health Care	3
45.951	Executive Development	3
45.972	Labor Relations	3
45.977	Information Systems for Health Care Facilities	3
45.978	Regulation and the American Health Care Industry	3
45.979	Integrative Models in Health Care	3
50.807	Abnormal Psychology	4
63.814	Grantsmanship	4

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN MEDICAL LABORATORY SCIENCE

Objectives

This program provides the opportunity for medical laboratory scientists to acquire increased expertise in laboratory science and in clinical laboratory research and development.

Graduates of this program should contribute significantly to the modern medical laboratory. They should be able to search literature to find and test available methodologies; to develop, modify, and evaluate new methods, and should be a qualified associate in the clinical pathology department. The graduate courses in administration and education offered in this program, together with those offered in the Graduate Schools of Business Administration and Education at Northeastern, allow students to prepare themselves for administrative or teaching positions.

Admission and Program Features

To be enrolled for graduate work, the applicant must hold a baccalaureate degree from a recognized institution and provide evidence of the applicant's ability to pursue a program of graduate study as determined by the Graduate Committee. His scholastic record must show distinction, with adequate preparation in the sciences, including one year of organic chemistry, college physics, and mathematics; one complete course of analytical chemistry; and a minimum of 24 quarter hours, or the equivalent, of biological sciences including basic microbiology, human physiology, genetics, and cell biology. Requirements in human physiology, genetics, and cell biology may be completed at the graduate level. Students admitted

with deficiencies must rectify them during the first 12 quarter hours of graduate work. Under certain circumstances, students may be allowed to take equivalency exams to remove any deficiencies.

Acceptance to the school is upon recommendation of the Medical Laboratory Science Academic Standing Committee and approval by the Graduate Committee of the Graduate School of Pharmacy and Allied Health Professions. It is anticipated that students may complete the degree requirements in a minimum of three years. However, in some cases this may be increased or decreased to satisfy a student's particular needs and requirements. A limited number of teaching assistantships may be available for exceptional students wishing to pursue their studies on a full-time basis.

Professional Requirement

At the completion of the Master of Science degree, the student must have written, or be eligible to write, the examination in medical technology or in one of the categorical or specialist certifications of the Board of Registry of the American Society of Clinical Pathologists. Students intending to complete their professional requirements in an approved hospital school of medical technology must also make direct application to the hospital program. Acceptance to the graduate program in medical laboratory science does not imply concomitant acceptance to a hospital program.

Certain students may be given the opportunity to complete their professional requirement through a Northeastern University affiliated hospital. Only those students completing their professional courses through Northeastern will receive a maximum of 8 quarter hours of graduate credit.

Curriculum

The program contains a core curriculum of 15 quarter-hour credits of required courses and eight quarter-hour credits selected from an elective core. In addition, 17 hours are to be selected from those graduate courses offered by the Graduate School of Pharmacy and Allied Health Professions or by other divisions in the University. These latter courses are to be selected with the guidance of the Director of the M.S. program in Medical Laboratory Science. A total of 40 quarter hours of academic work is required for this program.

In addition to the required course 87.990 Research Report I, each student working toward the degree of Master of Science in Medical Laboratory Science may select to take either 87.991 Research Report II (2-4 quarter hours of credit) or 87.992 MLS Thesis (6 quarter hours of credit). Students selecting 87.992 must register for this course three times (2 credits each). Grades for 87.990, 87.991 and 87.992 are recorded as Satisfactory or Unsatisfactory. Two unsatisfactory grades in 87.992 result in the student's dismissal from the thesis portion of the program.

The research report (I or II) may take the form of a comprehensive, critical review of the literature in a specialized area, design of a learning

package, and/or a specific program of experimental work on a single topic. Research Report I may be expanded, with the permission of the student's research adviser, into a master's thesis with a topic, adviser, and committee composed of not less than three members. Students wishing to continue their Research Report I topic, but who do not wish to pursue a thesis, may do so by selecting Research Report II. Research Report II may not be extended into a thesis. MLS thesis will culminate in a final oral thesis defense.

Comprehensive Examination

A comprehensive examination is required of all students, except those presenting a thesis. This exam will be offered once yearly to students with a minimum of 30 q.h. of course work, on a pass/fail basis. Students failing the examination are given one opportunity to remove this failure.

<i>Required Courses</i>		<i>Credits</i>
10.8H3	Biostatistics	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
87.990	Graduate Research Report I	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
	Seminars (3): 1 quarter hour each (87.890 or from other graduate programs)	<u>3</u>
	QUARTER HOURS	15

Students, who have previously completed basic Medical Laboratory Science courses in hematology, clinical chemistry and/or microbiology, are required to take a minimal number of related graduate courses to be determined by the Medical Laboratory Science Academic Standing Committee.

Elective Core

A minimum of eight credits must be taken from the following list:

18.240	Microbial Physiology	4
73.814	Concepts in Pharmacology I	2
73.845	Radioisotopes in Biological Systems	2
87.821	Medical Laboratory Management I	2
87.826	Health Science Education I	2
87.832	Hematology I	2
87.833	Immunobiology	2
87.842	Hematology II	2
87.843	Immunobiology Laboratory	2
87.845	Epidemiology	2
87.852	Hematology III	2
87.857	Cellular Pathology I	2
90.823	Biochemistry III	2

Elective Courses

Selection may be made from other courses in the electives core or from the following. Students may choose all electives in one area; i.e., the laboratory sciences, health science education, or laboratory administration.

5.913	Data Processing	2
12.828	Chemical Instrumentation	3
18.211	Parasitology	4
18.242	Medical Microbiology	2
18.245	Serology — Immunology	3
18.246	Serology — Immunology Laboratory	2
18.903	Environmental Microbiology	4
18.905	Marine Microbiology	4
18.907	Food Microbiology	2
18.909	Animal Virology	4
18.910	Microbial Genetics	3
18.915	Medical Mycology	2
18.940	Microbial Biochemistry	4
19.838	Human Learning and Cognition	3
21.840	Sociology of Medicine	3
21.843	Sociology of Education	3
21.847	Formal Organizations	3
21.850	Sociology of Occupations and Professions	3
21.910	The Sociology of Science	3
22.867	Health Care Management	3
22.868	Politics of Health Care Administration	3
22.876	Administrative Behavior	3
22.879	Science, Technology and the Administration of Public Policy	3
22.899	Public Issues in Human Resources	3
39.9G7	Public Policy in Manpower	3
39.9H1	Economics of Medical Care and Health	3
39.9H3	Economics of Education	3
41.817	Fiscal Planning, Budgeting and Control of Health Care Institutions	3
45.805	Operations Management I and II	3
45.815	Behavioral Concepts	3
45.819	Interpersonal Behavior	3
45.833	Operations Management in the Health Care System	3
45.951	Executive Development	3
45.971	Personnel Management	3
45.975	Introduction to Health Care Systems	3
45.976	Workers in the Health Care System	3
45.977	Information Systems for Health Care Facilities	3
50.815	Research Design	2
50.817	Advanced Research Design in Education	2

	Credits
52.817 Design, Production and Utilization of Instructional Materials	4
52.818 Developing Curriculum Learning	4
52.820 Principles of Programmed Learning	4
52.821 Administration of Instructional Media Programs	4
52.846 Developing Curriculum in Learning Packages (Advanced)	4
71.852 Health Care Administration I	2
71.853 Health Care Administration II	2
71.855 Human Relations in Health Care	2
72.834 Advanced Clinical Chemistry I	2
72.835 Advanced Clinical Chemistry II	2
72.863 Advanced Medicinal Chemistry III	2
72.864 Advanced Medicinal Chemistry IV	2
73.814 Concepts in Pharmacology I	2
73.815 Concepts in Pharmacology II	2
73.816 Concepts in Toxicology I	2
73.817 Concepts in Toxicology II	2
73.818 Special Topics in Pharmacology	2
73.820 Environmental Toxicology	2
87.810 Functions of the Human Systems	2
87.816 Principles of Hematology and Coagulation Related to Transfusion	3
87.822 Medical Laboratory Management II	2
87.827 Health Science Education II	2
87.828 Health Science Education III	2
87.843 Immunobiology Laboratory	2
87.858 Cellular Pathology II	2
87.870 Immunohematology Administration	2
87.871 Immunohematology Administration Laboratory	2
87.872 Transfusion Therapy	2
87.873 Transfusion Therapy Laboratory	2
87.874 Genetic and Immunological Aspects of Blood Group Identification	1
87.875 Genetic and Immunological Aspects of Blood Group Identification Laboratory	2
87.876 Principles and Foundations of the Blood Group Systems	2
87.877 Principles and Foundations of the Blood Group Systems Laboratory	2
87.878 The Design and Problems of Compatibility Testing	1
87.879 The Design and Problems of Compatibility Testing Laboratory	2
87.991 Graduate Research Report II	2-4
87.992 MLS Thesis	6
90.823 Biochemistry III	2

SAMPLE PROGRAM

YEAR 1

ELECTIVES

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
10.8H3 Biostatistics	2	18.211 Parasitology	4	18.903 Environmental Microbiology	4
18.211 Parasitology	4	18.242 Medical Microbiology	2	18.905 Marine Microbiology	4
18.909 Animal Virology	4	18.245 Immunology and Serology	3	18.907 Food Microbiology	4
18.910 Microbial Genetics	3	18.246 Immunology and Serology Laboratory	2	18.915 Medical Mycology	2
50.815 Research Design in Education	2	39.9H1 Economics of Medical Care and Health Manpower	2	18.940 Microbial Biochemistry	4
772.834 Advanced Clinical Chemistry I	2	50.815 Research Design in Education	3	19.838 Human Learning and Cognition	3
772.863 Advanced Medicinal Chem. III	2	50.817 Research Problems in Education	2	21.840 Sociology of Medicine	3
773.814 Concepts in Pharmacology I	2	50.821 Health Care Administration I	2	22.876 Administrative Behavior	3
87.810 Functions of the Human Systems	2	71.852 Advanced Clinical Chemistry II	2	39.9G7 Public Policy in Manpower	3
87.826 Health Science Education I	2	72.835 Concepts in Toxicology I	2	50.815 Research Design in Education	2
87.870 Immunohematology Administration	2	73.816 Drug Metabolism	2	71.853 Health Care Administration II	2
87.871 Immunohematology Administration Laboratory	2	73.844 Pathophysiology I	2	72.864 Advanced Medicinal Chemistry IV	2
87.872 Transfusion Therapy	2	87.811 Medical Laboratory Management I	2	73.817 Concepts in Toxicology II	2
87.873 Transfusion Therapy Laboratory	2	87.821 Health Science Education II	2	73.818 Special Topics in Pharmacology	2
87.990 Graduate Research Report I	2	87.845 Epidemiology	2	73.820 Environmental Toxicology	2
87.991 Graduate Research Report II	2-4	87.874 Aspects of Blood Group Identification	1	87.812 Pathophysiology II	2
87.992 Medical Laboratory Science Thesis	6	87.875 Genetic and Immunologic Aspects of Blood Group Identification Lab	1	87.816 Principles of Hematology & Coagulation Related to Transfusion	3
Summer Quarter		87.876 Principles and Foundations of the Blood Group Systems	1	87.822 Medical Lab. Management II	2
18.903 Environmental Microbiology	4	87.877 Principles and Foundations of the Blood Group Systems Laboratory	2	87.828 Health Science Education III	2
18.905 Marine Microbiology	4	87.990 Graduate Research Report I	2	87.833 Immunobiology	2
50.815 Research Design in Education	2	87.991 Graduate Research Report II	2-4	87.843 Immunobiology Laboratory	2
87.990 Graduate Research Report I	2	87.992 Graduate Research Report II	2	The Design & Problems of Compatibility Testing	1
87.991 Graduate Research Report II	2-4	Science Thesis	6	The Design & Problems of Compatibility Testing Laboratory	2
87.992 Medical Laboratory Science Thesis	6	Biochemistry I	2	Graduate Research Report II	2-4
90.821 Biochemistry I	2	Biochemistry II	2	Medical Laboratory Science Thesis	6
90.822 Biochemistry II	2			Biochemistry III	2

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN MEDICINAL CHEMISTRY

Objectives

The primary goal of this program is the education of professionals interested in the following areas: the rational development, isolation, and analysis of drugs; the understanding of the chemical mechanisms by which these compounds function in mammalian systems; and the metabolism of such biologically active agents. For this purpose the program is composed of four distinct areas of study: medicinal chemistry, pharmacology and toxicology, biochemistry, and organic chemistry. This type of background offers preparation to an individual interested in using chemistry for biological and clinical purposes. The medical research team needs scientists with this training and orientation.

Admission and Program Features

The Director of the M.S. program in Medicinal Chemistry serves as the Chairman of the Medicinal Chemistry Academic Standing Committee. The function of this Committee is to evaluate the background of the applicants and advise the Graduate Committee of the applicant's suitability for admission to the program. Additionally, the Director aids the graduate students in course selection and apprises them of the offerings that maximize their individual educational goals.

Application for admission to this program is welcomed from any individual who has obtained from a recognized institution a baccalaureate degree in pharmacy, chemistry, biology, and related programs within the biological or physical sciences. Further, an applicant's undergraduate record must indicate a high level of previous work and sufficient background in organic chemistry, mathematics, and biology. Applicants with deficiencies in these areas may be admitted as conditional students. Students admitted with deficiencies must rectify them during the first 12 quarter hours of graduate work.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. It is anticipated that students may complete the degree requirement in a minimum of three years; however, in some cases the duration may be increased or decreased to satisfy the particular needs and requirements of the student. No research report or thesis is required, but may be selected by those wishing to carry out an independent research program.

The Graduate School recognizes the divergent backgrounds and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objective.

General Requirements

A candidate must complete a minimum of 40 quarter hours of graduate work. A total of 33 required credits must be taken. The balance of the 40 hours should be taken from the elective sequence.

An individual who has deficiencies in any of the areas required for admission may take appropriate courses at Northeastern University concurrently with those graduate courses which do not require the deficient prerequisites. The appropriate evening courses offered at University College of Northeastern University are: Analytical Chemistry 12.421-12.423 or 12.847; Organic Chemistry 12.431-12.433; Physical Chemistry 12.441-12.443; and Human Anatomy and Physiology 18.424-18.426. Equivalent courses from this University or other accredited universities are usually accepted.

Curriculum

<i>Core Courses</i>		<i>Credits</i>
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Physical Organic Chemistry I	2
12.864	Stereochemistry and Mechanisms of Organic Reactions	2
12.866	Spectrometric Identification of Organic Reactions	2
*12.953	Identification of Organic Compounds	3
*72.808	Isolation & Identification of Natural Products	3
*72.812	Advanced Drug Synthesis	3
72.861	Advanced Medicinal Chemistry I	2
72.862	Advanced Medicinal Chemistry II	2
72.863	Advanced Medicinal Chemistry III	2
72.864	Advanced Medicinal Chemistry IV	2
73.814	Concepts in Pharmacology I	2
73.816	Concepts in Toxicology I	2
74.844	Drug Metabolism	2
87.810	Functions of the Human Systems	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
	QUARTER HOURS	33

Electives

72.834	Advanced Clinical Chemistry I	2
72.835	Advanced Clinical Chemistry II	2
72.850	Medicinal Chemistry Colloquium	2

*One of these three Core Courses should be taken.

72.865	Special Topics in Medicinal Chemistry	2
72.866	Phytochemistry	2
72.885	Heterocyclics in Medicinal Chemistry	2
72.903	Medicinal Chemistry Thesis	2-6
73.815	Concepts in Pharmacology II	2
73.818	Special Topics in Pharmacology	2
73.820	Environmental Toxicology	2
73.829	Experimental Pharmacology	2
90.823	Biochemistry III	2
90.824	Applications of Mass Spectrometry	2
QUARTER HOURS		6-7

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN PHARMACOLOGY

Objectives

The pharmacologist is concerned with the discovery, testing, and perfecting of drugs and the study of how they act, especially in mammalian systems. With the increasing concern of pharmaceutical companies, hospitals, and research institutions for knowledge of the mechanisms by which drugs produce their effects, the role of the pharmacologically trained scientist is ever expanding. In the education of such an individual, a broad background in pharmacology, physiology, anatomy, instrumentation, and chemistry is essential. The goal of Northeastern's program is to meet this objective and to allow individuals to prepare themselves to make significant contributions in the many areas requiring pharmacological expertise.

Admission and Program Features

The Director of the M.S. program in Pharmacology serves as Chairman of the Pharmacology Academic Standing Committee. The function of this Committee is to evaluate the background of the applicants and advise the Graduate Committee of the applicant's suitability for admission to the program. Additionally, the Director guides the graduate students in course selection and apprises them of the offerings that maximize their individual educational goals.

Application for admission as a graduate student is welcomed from any individual who has obtained from a recognized institution a baccalaureate degree in pharmacy, chemistry, biology, or related programs within the biological or physical sciences. Further, the applicant's undergraduate record must indicate sufficient background in organic chemistry, mathematics, and biology. However, applicants with deficiencies in these areas may be admitted as conditional students. Students admitted with deficiencies must remove them during the first 12 quarter hours of graduate work.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall,

SAMPLE PROGRAM

MASTER OF SCIENCE IN MEDICINAL CHEMISTRY

YEAR 1

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
12.861 Advanced Organic Chemistry I	2	12.862 Advanced Organic Chemistry II	2	12.863 Physical Organic Chemistry I	2
87.810 Functions of Human Systems	2	90.822 Biochemistry II	2	12.866 Spect. Ident. Organic Compounds	2
90.821 Biochemistry I	2				

Summer Quarter

72.867 Medicinal Chemistry Seminar	2				
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YEAR II

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
12.864 Stereochemistry and Mechanisms of Organic Reactions	2	72.862 Advanced Medicinal Chemistry II	2	Elective	2
72.861 Advanced Medicinal Chemistry I	2	73.816 Concepts in Toxicology I	2	72.865 Advanced Medicinal Chemistry III	2
73.814 Concepts in Pharmacology I	2				

Fall Quarter

Elective	2				
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YEAR III

<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
73.844 Drug Metabolism	2	72.864 Advanced Medicinal Chemistry IV	2
Elective	2		

ELECTIVES

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
72.812 Advanced Drug Synthesis	3	72.808 Identification & Isolation of Natural Products	3	12.953 Identification of Organic Compounds	3
72.834 Clinical Chemistry I	2	72.835 Advanced Clinical Chemistry II	2	72.850 Medicinal Chemistry Colloquium	2
72.836 Clinical Chemistry II	2	72.850 Medicinal Chemistry Colloquium	2	72.903 Medicinal Chemistry Thesis	2-6
72.850 Medicinal Chemistry Colloquium	2	72.865 Special Topics in Medicinal Chemistry	2	73.820 Environmental Toxicology	2
72.866 Phytochemistry	2-6	72.885 Heterocyclic Drugs in Medicinal Chemistry	2	73.829 Experimentation in Pharmacology	2
72.903 Medicinal Chemistry Thesis	2	72.903 Medicinal Chemistry Thesis	2	90.823 Biochemistry III	2
73.818 Special Topics in Pharmacology	2	73.815 Pharmacology II	2-6		

Summer Quarter

90.821 Biochemistry I	2				
90.822 Biochemistry II	2				
90.824 Applications of Mass Spectrometry	2				

winter, spring, and summer quarters. It is anticipated that students may complete the degree requirements in a minimum of three years. However, the duration may be longer or shorter, depending upon the particular student. A thesis option is available for a maximum of 8 credits but is not required. Thesis and research courses are graded on a pass/fail basis.

The Graduate School recognizes the divergent background and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objectives.

General Requirements

A candidate must complete a minimum of 40 quarter hours of graduate work. A total of 24 required credits must be taken. The balance of the 40 quarter hours may be selected from graduate courses in the Graduate School of Pharmacy and Allied Health Professions or in other divisions of the University. Selection of the elective courses should be made with the approval of the Director of the M.S. program in Pharmacology.

Curriculum

1. <i>Required Courses</i>		<i>Credits</i>
10.8H3	Biostatistics	2
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II (or equivalent)	2
73.818	Special Topics in Pharmacology	2
73.835	Neuropharmacology	2
73.844	Drug Metabolism	2
*73.870	Pharmacology Seminar	2
87.810	Functions of the Human Systems (or equivalent)	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
QUARTER HOURS		24
2. <i>Elective Courses</i>		
18.835	Mammalian Physiology	4
18.840	Comparative Physiology of Regulatory Mechanisms	4
18.842	Vertebrate Endocrinology	2
18.843	Procedures in Endocrinology	3
18.909	Animal Virology	4
72.834	Advanced Clinical Chemistry I	2
72.835	Advanced Clinical Chemistry II	2

*This course may be taken a second time for elective credit.

SAMPLE PROGRAM

MASTER OF SCIENCE IN PHARMACOLOGY

YEAR I

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
73.814 Concepts of Pharmacology I	2	73.815 Concepts of Pharmacology II	2	73.835 Neuropharmacology	2
87.810 Functions of Human Systems	2	Elective	2	Elective	2

YEAR II

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
Elective	2	73.816 Concepts of Toxicology I	2	73.817 Concepts in Toxicology II or	2
90.821 Biochemistry I	2	90.822 Biochemistry II	2	73.820 Environmental Toxicology	2
				73.870 Pharmacology Seminar	2

YEAR III

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
10.8H3 Biostatistics	2	72.844 Drug Metabolism	2	73.829 Experimental Pharmacology	2
Special Topics in Pharmacology	2	Elective	4	Elective	2
				Elective	2

Summer Quarter

90.824 Applications of Mass. Spectrometry	2
Elective	2

ELECTIVES

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
18.842 Vertebrate Endocrinology	2	18.835 Mammalian Physiology	4	18.840 Comp. Phys. of Reg. Mech.	4
18.909 Animal Virology	4	72.835 Advanced Clinical Chemistry II	2	18.843 Procedures in Endocrinology	3
72.834 Advanced Clinical Chemistry I	2	72.862 Advanced Medicinal Chemistry II	2	72.861 Advanced Medicinal Chemistry I	2
72.863 Advanced Medicinal Chemistry III	2	Chemistry II	2	72.864 Advanced Medicinal Chemistry IV	2
73.904 Pharmacology Thesis	2-8	Special Topics in Medicinal Chemistry	2	73.904 Pharmacology Thesis	2-8
		Pharmacology Thesis	2-8	73.820 Environmental Toxicology	2
		Pathophysiology I	2	73.829 Experimental Pharmacology	2
				73.845 Radioisotopes in Biolog. Systems	2
				73.871 Research Report in Pharmacology I	2
				73.872 Research Report in Pharmacology II	2
				87.812 Pathophysiology II	2
				87.833 Immunobiology	2
				87.843 Immunobiology Lab.	2
				90.823 Biochemistry III	2

Summer Quarter

73.904 Pharmacology Thesis	2-8
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72.861	Advanced Medicinal Chemistry I	2
72.862	Advanced Medicinal Chemistry II	2
72.863	Advanced Medicinal Chemistry III	2
72.864	Advanced Medicinal Chemistry IV	2
73.820	Environmental Toxicology	2
73.829	Experimental Pharmacology	3
73.845	Radioisotopes in Biological Systems	2
73.871	Research Report in Pharmacology I	2
73.872	Research Report in Pharmacology II	2
73.904	Pharmacology Thesis	2-8
73.845	Radioisotopes in Biological Systems	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
87.833	Immunobiology	2
87.843	Immunobiology Laboratory	2
90.823	Biochemistry III	2
90.824	Applications of Mass Spectrometry	2

Additional electives may be selected from other appropriate graduate courses in the University with the approval of the Director of the M.S. program in Pharmacology and the course instructor.

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN RADIOPHARMACEUTICAL SCIENCE

Objectives

During the last decade many new experimental tools and methods have been placed in the hands of professionals and practitioners in the allied health professions. These have been used to probe more widely and more deeply into the nature of man's clinical problems. Of all the new techniques, none has been employed in more diverse means nor yielded greater rewards than the use of radioactive isotopes for both diagnostic and therapeutic procedures.

There is a critical need for individuals with background and training in the area of radiopharmaceuticals and radiochemicals. For qualified individuals, employment opportunities exist in the pharmaceuticals industry, hospitals, and various clinical and chemical laboratories. The function of this program is to present the in-depth knowledge necessary for the education of such professionals.

Admission and Program Features

The Director of the M.S. program in Radiopharmaceutical Science serves as Chairman of the Radiopharmaceutical Science Academic Standing Committee. The function of this Committee is to evaluate the background of the applicants and advise the Graduate Committee of the applicant's suitability for admission to the program. Additionally, the Director guides

the students in course selection and apprises them of the offerings that maximize their individual educational goals.

Applicants for this program must have completed a baccalaureate program in pharmacy, biology, chemistry, medical technology, physics or a related field. Undergraduate requirements are: a minimum of two quarters of organic chemistry, one quarter of analytical chemistry or its equivalent, two quarters of human physiology, and one quarter of physics. An individual who has deficiencies in any of these areas may take appropriate courses at Northeastern University or at any other recognized institution concurrently with those graduate courses which do not require the deficient prerequisites. Students admitted with deficiencies must rectify them during the first 12 quarter hours of graduate work.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. It is anticipated that students may complete the degree requirements in a minimum of three years; however, in some cases the duration may be increased or decreased to satisfy the particular needs and requirements of the student. No research or thesis is required, but a research elective is available.

The Graduate Committee recognizes the divergent backgrounds and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objectives.

Curriculum

<i>Required Courses</i>		<i>Credits</i>
10.8H3	Biostatistics	2
11.871	Radiation Physics	2
11.872	Radiobiology	2
72.815	Nuclear Medicine I: Instrumentation	2
72.816	Nuclear Medicine II: Instrumentation	2
72.817	Nuclear Medicine III: Radiopharmaceuticals	2
72.818	Nuclear Medicine IV: Radiopharmaceutical Laboratory	2
72.844	Seminar and Research Report in Radiopharmaceutical Science	2
72.847	Dosimetry and Health Physics	2
72.848	Clinical Aspects of Nuclear Medicine	2
72.849	Radiopharmacy Internship	2
90.821	Biochemistry I	2
QUARTER HOURS		24

Elective Core

A minimum of 10 credits must be taken from the following list:

72.834	Advanced Clinical Chemistry I	2
72.835	Advanced Clinical Chemistry II	2
72.863	Anti-infectives	2

SAMPLE PROGRAM MASTER OF SCIENCE IN RADIOPHARMACEUTICAL SCIENCE

YEAR I

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
10.8H3 Biostatistics or Elective	2	11.872 Radiobiology	2	10.8H3 Biostatistics or Elective	2
11.871 Radiation Physics	2	72.815 Nuclear Medicine I	2	72.816 Nuclear Medicine II	2

YEAR II

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
90.821 Elective	2	72.817 Nuclear Medicine III	2	72.818 Nuclear Medicine IV	2
Biochemistry I	2	Elective	2	Elective	2

YEAR III

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
72.847 Dosimetry and Health Physics	2	72.844 Seminar and Research Report	2	72.848 Clinical Aspects of Nuclear Medicine	2
72.849 Internship or Elective	2	72.849 Internship or Elective	2	72.849 Internship or Elective	2

ELECTIVES

<i>Fall Quarter</i>	<i>Credits</i>	<i>Winter Quarter</i>	<i>Credits</i>	<i>Spring Quarter</i>	<i>Credits</i>
12.841 Inorganic Chemistry I	2	12.828 Chemical Instrumentation	2	12.846 Coordination Chemistry	2
12.861 Advanced Organic Chemistry I	2	12.842 Inorganic Chemistry II	2	12.866 Spectrometric Identification of Compounds	2
18.842 Vertebrate Endocrinology	2	12.862 Advanced Organic Chemistry II	2	18.840 Comparative Physiology of Regulatory Mechanisms	2
72.834 Advanced Clinical Chemistry I	2	18.245 Serology-Immunology	3	18.843 Procedures in Endocrinology	3
72.863 Advanced Medical Chemistry III	2	18.835 Mammalian Physiology	4	72.864 Advanced Medical Chemistry IV	2
73.814 Concepts in Pharmacology I	2	72.835 Advanced Clinical Chemistry II	2	73.817 Concepts in Toxicology II	2
73.818 Special Topics in Pharmacology	2	72.865 Special Topics in Medicinal Chemistry	2	73.820 Environmental Toxicology	2
87.810 Function of Human Systems	2	73.815 Concepts in Pharmacology II	2	73.822 Pathology	2
		73.816 Concepts in Toxicology I	2	87.812 Pathophysiology II	2
		73.844 Drug Metabolism	2	87.833 Immunobiology	2
		87.811 Pathophysiology I	2	87.843 Immunobiology Laboratory	2
		90.822 Biochemistry II	2	90.823 Biochemistry III	2

<i>Summer Quarter</i>	<i>Credits</i>
72.867 Medicinal Chemistry Seminar	2

72.864	Cancer Therapy and Carcinogenesis	2
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.820	Environmental Toxicology	2
73.844	Drug Metabolism	2
87.810	Functions of the Human Systems	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
90.822	Biochemistry II	2
90.823	Biochemistry III	2

Additional Electives

These are to be taken with the approval of the Director of Radiopharmaceutical Science, and the course instructor. Selection may be made from the above courses, as well as from the following and from other appropriate graduate courses in the University. Course availability is subject to change.

12.841	Advanced Inorganic Chemistry I	2
12.842	Advanced Inorganic Chemistry II	2
12.846	Coordination Chemistry	2
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.866	Spectrometric Identification of Compounds	2
18.245	Serology-Immunology	3
18.835	Mammalian Physiology	4
18.840	Comparative Physiology of Regulatory Mechanisms	2
18.842	Vertebrate Endocrinology	2
18.843	Procedures in Endocrinology	3
72.865	Special Topics in Medicinal Chemistry	2
73.818	Special Topics in Pharmacology	2
73.822	Pathology	2
87.833	Immunobiology	2
87.843	Immunobiology Laboratory	2

A minimum total of 40 quarter hours of graduate credit is necessary for completion of the Master of Science degree in Radiopharmaceutical Science.

FULL-TIME DOCTOR OF PHILOSOPHY DEGREE PROGRAM IN MEDICINAL CHEMISTRY

Objectives

This program provides research scientists, interested in applying chemistry to the solution of biological and medical problems, with the educational opportunity to prepare themselves in this area of research. Such

research may take the form of synthesizing new drugs — both radioactive and nonradioactive — for diagnosis or for treating a variety of disease conditions, determining metabolic products derived from compounds of an endogenous or exogenous origin, elucidating various biochemical pathways, developing and utilizing analytical methodologies for drugs and various biochemical compounds, and isolating drugs from natural sources. These are a few of the types of research projects which are available within the Department of Medicinal Chemistry and Pharmacology.

In addition to students' demonstration of superior proficiency in original research, they must acquire the background knowledge via courses and outside reading in the current scientific literature in their area of specialization to complete the qualifying examination satisfactorily. For this purpose, a working knowledge of at least one foreign language is required. Any student who wishes to pursue the doctorate must write directly to the Director of the Ph.D. program.

Admission and Program Features

Application for admission is welcomed from any individual who has obtained a baccalaureate degree in pharmacy, chemistry, biology, medical laboratory science, and related programs within the biological or physical sciences from a recognized accredited institution. Further, the undergraduate record must indicate a very high level of previous work and sufficient background in organic chemistry, mathematics, and biology. Deficiencies in these areas must be removed within the first academic year. Admission to this program is by acceptance of the Graduate Committee. A student is considered to be in the doctoral program after being accepted, but not before taking up full-time residence.

Course Requirements

There are no specific course requirements beyond those which may be required for a master's degree, but in order for a student to be completely prepared for both the research program and the qualifying examination, an appropriate course background is desirable.

INTERDISCIPLINARY PH.D. PROGRAM IN FORENSIC CHEMISTRY

This program is being offered in conjunction with the Colleges of Criminal Justice and Northeastern University's Institute of Chemical Analysis, Applications and Forensic Science. This unique program in an area of societal need is designed as a preparation for research and leadership positions in forensic laboratories. The Graduate School of Pharmacy and Allied Health Professions is the registering department for specialization in forensic toxicology. Two other specializations, namely forensic analytical chemistry and forensic materials science are administered by the Chemistry Department in conjunction with the College of Criminal Justice. Admission is made through the registering department.

For students entering with a B.S., completion of the M.S. course requirements in Forensic Chemistry with a B average is required to qualify for further Ph.D. study. For students with M.S. degrees in forensic science or the natural sciences, individual programs are planned according to the student's background. The course of study includes comprehensive examinations, thesis research to be carried out at the Institute of Chemical Analysis, Applications and Forensic Science and a recommended internship at a major forensic laboratory engaged in research.

courses

DESCRIPTION OF COURSES

5.800 See Graduate School of Engineering Catalog.

11.871 Radiation Physics (2 q.h.)

An introduction to the nucleus and modes of spontaneous radioactive transformation. The isotopic abundance of the elements, naturally occurring radioelements and decay series, the kinetics of decay and the relationship between mass and energy. The nature of the emitted radiation and its interaction with matter. *Prep. Undergraduate physics.*

Yearly, Fall Quarter

11.872 Radiobiology (2 q.h.)

The biological effects of ionizing radiation. Included are a discussion of elementary target theory, radiation chemistry, effects on macromolecules, cellular and chromosomal effects, recovery processes, and the acute and long-term effects of radiation with emphasis on man, as well as a discussion of environmental sources of radiation and the characteristics of internal and external human exposure. *Prep. 11.871.*

Yearly, Winter Quarter

12.953 Identification of Organic Compounds (3 q.h.)

Qualitative analysis of organic compounds and mixtures, using physical, chemical, and instrumental methods. *Prep. 12.155.*

Yearly, Spring and Summer Quarters

12.500 See University College Catalog.

12.821 Analytical Separations (2 q.h.)

Theory and practice of analytical separation techniques. Emphasis on fundamentals as they relate to practice. Topics based mainly on chromatographic processes, including gas and high-speed liquid chromatography. Other topics include: zone refining, liquid extraction, and electrophoresis.

Yearly, Fall Quarter

12.822 Electroanalytical Chemistry I (2 q.h.)

The theory, applications, and instrumentation for potentiometry, pH, ion selective electrodes, conductancy and high-frequency measurements. The techniques of direct measurement, titration endpoint detection, and on-line measurements.

Spring Quarter

12.823 Optical Methods of Analysis I (2 q.h.)

Theory and practice of absorption spectrometric methods of analysis. Optics and basic instrumental considerations.

Winter Quarter

12.824, 12.825, 12.826 Special Topics in Analytical Chemistry I, II, III

(2 q.h.)

Selected topics of current importance in analytical chemistry.

Yearly, Fall, Winter, and Spring Quarters

12.829 Computers in Chemistry (3 q.h.)

A laboratory-lecture course focusing on the use of small digital computers for real-time control of chemical instruments. Topics include digital logic, real-time data structures, A/D and D/A conversion, and noise and other aspects of real-time computer interfacing. Programming will be done on a PDP-11 computer in MIRACL, a language designed for real-time processing. *Prep. consent of instructor.*

Fall Quarter

12.861, 12.862 Advanced Organic Chemistry I, II (2 q.h.)

An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material. *Prep. one year of Organic Chemistry.*

Yearly, Fall and Winter Quarters

12.863 Physical Organic Chemistry (2 q.h.)

Topics in basic physical organic chemistry: molecular polarity, equilibrium in kinetics, reactivity and structure, solvent effects, acid base catalysis, orbital symmetry, aromaticity, and related subjects. *Prep. 12.862 or consent of the instructor.*

Spring Quarter

12.864, 12.865 Organic Stereochemistry and Reaction Mechanisms I, II

(2 q.h.)

Interrelations of the stereochemistry of organic molecules with their physical and chemical behavior. Conformational analysis. The effects of spatial relationships on transition states, and equilibria and reaction rates as an introduction to the study of organic reaction mechanisms. *Prep.*

12.863

Fall and Winter Quarters

12.866 Spectrometric Identification of Organic Compounds (2 q.h.)

Interpretation of the ultraviolet, infrared, nuclear magnetic resonance spectra of organic compounds. *Prep. one year of Organic Chemistry.*

Yearly, Spring Quarter

12.876, 12.877 Organic Reaction Mechanisms and Organic Synthesis I, II

(2 q.h.)

The fundamental factors influencing the courses of organic reactions. Substitution reactions. Pericyclic reactions. Synthetic methods as an introduction to organic synthesis. *Prep. 12.865 or concurrent registration therein.*

Winter and Spring Quarters

12.800 See Graduate School of Arts and Sciences Catalog.

12.953 Identification of Organic Compounds (3 q.h.)

Qualitative analysis of organic compounds in mixtures, using physical, chemical and instrumental methods. Corresponds to Chemistry 12.253.

Prof. Seitz

Spring Quarter

18.200 See Undergraduate Catalog.

18.240 Microbial Physiology (4 q.h.)

The biochemical changes brought about through microbial activities; measurement of metabolic biosynthesis and degradation, rates of reaction and determination of end products. *Prep. 18.220.*

Yearly, Fall and Winter Quarters

18.800 See Graduate School of Arts and Sciences Catalog.

19.800 See Graduate School of Arts and Sciences Catalog.

21.800 See Graduate School of Arts and Sciences Catalog.

39.900 See Graduate School of Arts and Sciences Catalog.

41.800 See Graduate School of Business Administration Catalog.

45.800 See Graduate School of Business Administration Catalog.

50.800 See Graduate School of Education Catalog.

71.816 Clinical Pharmacokinetics (2 q.h.)

Emphasis is placed upon application of various pharmacokinetic techniques in estimating dosage regimens, evaluating drug therapy, consulting on drug selection and assessment of bioavailability and bioequivalence data. *Prep. A background in biopharmaceutics or consent of instructor.*

Prof. Shargel

Yearly, Spring Quarter

71.822 Seminar in Hospital Pharmacy (2 q.h.)

Seminar on current developments or specific problems in hospital pharmacy which have been studied in depth by students with guidance from the graduate faculty. The student presentations may be alternated with guest speakers on topics of current interest. Student participation in the discussions is an essential objective of the course. *Prep. admission to hospital pharmacy program. Prof. Taubman*

Yearly, Summer Quarter

71.823 Legal Aspects/Federal Legislation in Pharmacy (2 q.h.)

An analysis of the federal and state laws relating to the distribution of drugs in the institution. Included are common-law liabilities such as malpractice and other frequently encountered problems. *Prep. admission to hospital pharmacy program. Prof. Goldstein*

Yearly, Fall Quarter

71.844 Hospital Pharmacy Administration I (2 q.h.)

Administration of the pharmacy department in an institutional environment. Study of budgets, purchasing, and distribution procedures. Medium-scale production of preparations for dispensing. Personnel management, public relations, legal responsibilities, educational demands, professional communications, and general administrative function of a hospital pharmacist. *Prep. admission to hospital pharmacy program or consent of instructor.*

Prof. Webb

Yearly, Fall Quarter

71.845 Hospital Pharmacy Administration II (2 q.h.)

A continuation of 71.844 Hospital Pharmacy Administration I. *Prep. 71.844.*

Staff

Yearly, Winter Quarter

71.846 Hospital Pharmacy Administration III (2 q.h.)

A continuation of 71.845 Hospital Pharmacy Administration II. *Prep. 71.845.*

Prof. Gouveia

Yearly, Spring Quarter

71.852 Health Care Administration I (2 q.h.)

The socioeconomics and statistics of health care, including governmental programs, legislative trends, third-party insurance and welfare programs, and other areas that may affect the management of the modern institutional pharmacy. *Prep. admission to the hospital pharmacy program or consent of instructor.* *Prof. Goldstein*

Alternate Years, Winter Quarter

71.853 Health Care Administration II (2 q.h.)

A continuation of 71.852 Health Care Administration I. *Prep. 71.852.*

Prof. Goldstein

Alternate Years, Spring Quarter

71.854 Clinical Pharmacy (2 q.h.)

The patient-oriented aspects of the application of therapeutic agents to hospital patients. An in-depth study of the relation of therapeutic regimens to laboratory tests and drug interactions. The role of the hospital pharmacist as an active member of the actual health-care team dealing directly with inpatients and outpatients. *Prep. admission to hospital pharmacy program or consent of instructor.* *Prof. Scheife*

Yearly, Fall Quarter

71.855 Human Relations in Health Care (2 q.h.)

A study of personnel psychology, organization structuring, wage and performance incentives, employee evaluations, and policy in relation to accepted personnel concepts and procedures. *Prep. admission to hospital pharmacy program or consent of instructor.* *Mr. Smith*

Yearly, Winter Quarter

71.856 Information Science in Hospital Pharmacy (2 q.h.)

The terminology and operation of data processing systems, including hardware and software, are presented. An extensive review of past, present and future applications of data processing systems to institutional phar-

macy practice is a major focus of this course. Systems design, evaluation and proposal development to administrators are discussed. *Prep. admission to hospital pharmacy program or consent of instructor. Prof. Gouveia*
Alternate Years, Winter Quarter

71.858 Contemporary Therapeutics I (2 q.h.)

Recent developments in current therapeutic approaches and their rationale in the treatment of cardiovascular, neurological, gastrointestinal, musculoskeletal, and metabolic diseases of a noninfectious nature. Therapy related to aging and selected genetic diseases. *Prep. 71.854. Prof. Scheife*
Alternate Years, Winter Quarter

71.859 Contemporary Therapeutics II (2 q.h.)

Current concepts of infectious diseases and the rationale for the chemotherapeutic treatment of these conditions. Diseases of the blood and blood-forming organs, neoplastic disease, and diseases related to deficiency states. *Prep. 71.854. Prof. Scheife*
Alternate Years, Spring Quarter

71.860 Drug Monitoring (2 q.h.)

The process by which drugs are monitored to determine their effectiveness, safety, prevention of iatrogenic factors, drug-drug interactions, and matters affecting patient compliance with a therapeutic regimen. The utilization of this information in improving patient care. *Prep. 71.854. Staff*
Yearly, Spring Quarter

71.861 Sterile Products (2 q.h.)

Theory, principles, methods, and techniques in preparing sterile, pyrogen- and particulate-free products. Equipment and laboratory design required for manufacturing different types of sterile products and the practical considerations essential for their production. *Prep. Microbiology. Prof. Krause, Prof. Janousek*
Yearly, All Quarters

71.862 Hospital Preparations (2 q.h.)

Therapeutic concepts, pharmaceutical problems, and methods of preparing various specialized clinical preparations and mixtures. These include: hyperalimentation solutions, dialysis solutions, cationic or anionic adjustment solutions, irrigation solutions, pediatric preparations, reconstitution preparations, additive admixtures, and unit dose packaging. *Prep. admission to hospital pharmacy program.*
Alternate Years, Spring Quarter

71.904 Hospital Pharmacy Thesis (2-6 q.h.)

Prep. Written permission of instructor.
Yearly, All Quarters

72.808 Identification and Isolation of Natural Products (3 q.h.)

A laboratory course in the identification of various types of plant constituents that have medicinal/pharmaceutical use, and the isolation and characterization of known and/or unknown chemical compounds from

selected plant samples. *Prep. at least one year of Organic Chemistry and some background in plant chemistry, e.g., 72.253 or 72.866 or by permission of instructor. Prof. Raffauf* Alternate Years, Winter Quarter

72.812 Advanced Drug Synthesis (3 q.h.)

Application of synthetic and analytical techniques to the formation of new drugs. *Prep. two quarters of Organic Chemistry with laboratory. Prof. Neumeyer* Yearly, Fall Quarter

72.815 Nuclear Medicine I: Instrumentation (2 q.h.)

An introduction to nuclear detection techniques by both lecture and laboratory demonstration. All types of systems will be considered, including scintillation, ionization, gas and solid-state detectors. Basic principles of spectrometry with an emphasis on sodium iodide detectors will be studied. *Prep. 11.871. Prof. Jones, and Staff* Alternate Years, Winter Quarter

72.816 Nuclear Medicine II: Instrumentation (2 q.h.)

A study of the application of nuclear detection techniques in the physical aspects of nuclear medicine. Current clinical instrumentation including gamma cameras and scanners, probes and whole body counters, as well as future developments such as the solid-state and the multiwire proportional cameras, and positron and tomographic imaging devices. Principles of collimation are studied with each system. The application of computers in nuclear medicine. This course includes both lecture and laboratory demonstration and is a companion course to 72.815. *Prep. 11.871 and 72.815. Prof. Jones* Alternate Years, Spring Quarter

72.817 Nuclear Medicine III: Radiopharmaceuticals (2 q.h.)

A study of the chemical and biological aspects of nuclear medicine. A discussion of the methods of radiopharmaceutical preparation and quality control, the use of the agent in organ imaging and as disease specific radiotracers. As well as *in vivo* nuclear medicine, *in vitro* tests will be considered, including radioimmunoassay and competitive binding assays. The therapeutic use of radioactive compounds will also be studied. *Prep. 72.815 and 72.816. Prof. Davis* Alternate Years, Winter Quarter

72.818 Nuclear Medicine IV: Radiopharmaceutical Laboratory (2 q.h.)

Demonstrations and discussions of the preparation and quality control of radiopharmaceuticals derived from reactor, accelerator and generator-produced radionuclides. Assay techniques for radiochemical, radionuclide and chemical purity. Regulatory implications in the handling and dispensing of radioactive drugs. This is a companion course to 72.817. *Prep. 72.817. Prof. Davis* Alternate Years, Spring Quarter

72.825 Special Topics in Clinical Chemistry (2 q.h.)

Each year a recent special topic of general interest in clinical chemistry is selected for this course. *Prof. Giese* Yearly, Winter Quarter

72.834 Advanced Clinical Chemistry I (2 q.h.)

Principles, instrumentation methodologies, and interpretations in clinical chemistry. *Prep. 90.823. Prof. Giese* Yearly, Fall Quarter

72.835 Advanced Clinical Chemistry II (2 q.h.)

A continuation of Clinical Chemistry I. *Prep. 72.834. Prof. Giese* Yearly, Winter Quarter

72.837, 72.838, 72.839 Seminar and Report in Clinical Chemistry I, II, III (2-6 q.h.)

Reports and discussions of current journal articles in clinical chemistry. *Prep. 72.835. Prof. Giese* Yearly, Spring Quarter

72.844 Seminar and Research Report in Radiopharmaceutical Science (2 q.h.)

This course is designed to familiarize the student with literature sources and the latest developments in radiopharmaceutical science. A written and oral presentation will be required in a particular area as evidence of an ability to organize and evaluate published material. *Prep. 72.816. Prof. Davis* Yearly, Winter Quarter

72.847 Dosimetry and Health Physics (2 q.h.)

Review of radiation units and measures of dose. Emphasis will be on the calculation of absorbed dose to the human body from gamma and beta emitters using MIRD pamphlets. Also discussed will be the health physics aspects of nuclear medicine including radiation protection, shielding design and instrumentation. *Prep. 72.816. Mr. Cobb* Alternate Years, Fall Quarter

72.848 Clinical Aspects of Nuclear Medicine (2 q.h.)

The current practice of diagnostic nuclear medicine in large medical centers and small community hospitals will be discussed. The effect of pathology in the distribution of radiopharmaceuticals will be considered on an organ and disease basis and illustrated with actual patient findings. The techniques employed in imaging the various organs and body compartments will be presented. Factors influencing the decision to perform a diagnostic nuclear medicine procedure and the choice of the agent to be employed will be discussed. *Prep. 72.818. Prof. Kaplan* Alternate Years, Spring Quarter

72.849 Radiopharmacy Internship (2 q.h.)

This is designed as a practical on-site introduction to the use of radiopharmaceuticals in the clinical environment. The student will participate in all normal functions of a radiopharmacy. Operations such as ordering, preparation, dispensing and distribution of radiodiagnostics, manufacture of nonroutine agents and quality control procedures and record keeping. This is considered a laboratory course. Arrangements are usually made on an individual basis, and the site of the radiopharmacy will be by approval of

the instructor. Offered during all quarters, registration will take place during the spring quarter only. *Prep. 72.818. Prof. Davis* Yearly, All Quarters

72.850 Medicinal Chemistry Colloquium (2 q.h.)

Oral presentations by the participants on current research in medicinal chemistry and related areas in chemistry. Included will be the theoretical basis of the problem as well as experimental results obtained. *Prep. Ph.D. Candidate. Staff* Yearly, All Quarters

72.861 Advanced Medicinal Chemistry I (2 q.h.)

Presentation and discussion of the chemistry, structure-activity relationships, and mechanism of action of general anesthetics, hypnotics and sedatives, antiepileptics, analgetics, tranquilizers, and muscle relaxants. A consideration of the mechanics of drug design and methods of modification is undertaken. *Prep. two quarters of Organic Chemistry. Prof. Granchelli* Alternate Years, Spring Quarter

72.862 Advanced Medicinal Chemistry II (2 q.h.)

A discussion of drugs acting on the central nervous system, with special emphasis on the action mechanism of the chemical mediators of the peripheral nervous system. The role of the agents affecting this system — adrenergic and cholinergic and reversible and irreversible inhibitors of these systems — is discussed in relation to their chemical structure and biological activity. *Prep. two quarters of Organic Chemistry. Prof. Hanson* Alternate Years, Winter Quarter

72.863 Advanced Medicinal Chemistry III (2 q.h.)

A study of various chemotherapeutic agents employed in the treatment of infectious diseases. Included are: the sulfonamides, antibiotics, antivirals; antitubercular, antifungal, and antimalarial agents. Special emphasis is on structure-activity relationships, mechanisms of action, and modern research in each area. *Prep. two quarters of Organic Chemistry. Prof. Warner* Alternate Years, Fall quarter

72.864 Advanced Medicinal Chemistry IV (2 q.h.)

Recent developments in new approaches to both carcinogenesis and to the treatment of cancer are emphasized, including alkylating agents, anti-metabolites, hormones, miscellaneous compounds, and combinations of the above with radiation and immunology. Possible mechanisms of carcinogenesis and chemotherapeutic action explored. *Prep. two quarters of Organic Chemistry. Prof. Rosowsky* Alternate Years, Spring Quarter

72.865 Special Topics in Medicinal Chemistry (2 q.h.)

A special area of medicinal chemistry, including either steroids, CNS compounds, pharmacodynamic agents or chemotherapeutics; their chemistry and structure. *Prep. two quarters of Organic Chemistry. Staff* Alternate Years, Winter Quarter

72.866 Phytochemistry (2 q.h.)

The important classes of chemical compounds produced by plants from the standpoint of their biogenetic origin, detection, isolation, and characterization. Application of these techniques to research in pharmacy, medicine, economics, botany, taxonomy. Introduction to the literature of plant chemistry. *Prep. two quarters of Organic Chemistry and two quarters of Biology. Prof. Raffauf* Alternate Years, Fall Quarter

72.867 Medicinal Chemistry Seminar (2 q.h.)

Selection and discussion of pertinent articles in the very recent medicinal chemistry literature carried out by faculty and students. Background and the basis for this research discussed. *Prep. two quarters of Organic Chemistry. Staff* Yearly, Summer Quarter

72.880 Cardiovascular Drugs (2 q.h.)

The course is aimed so as to expose the students to current ideas and developments in the area of cardiovascular drug research. Lectures will emphasize the most recent concepts regarding the etiology and pathophysiology of cardiovascular disorders and the proposed mechanism of drug action. *Prep. 73.814. Prof. Hanson, Prof. Deth*

Yearly, Fall Quarter

72.885 Heterocyclic Drugs in Medicinal Chemistry (2 q.h.)

The course examines the application of the combined principles of medicinal and heterocyclic chemistry to the synthesis of pharmaceutically useful compounds. The emphasis of the material presented will be upon a critical evaluation of the literature methods and rationale. *Prep. Advanced organic chemistry or concurrent registration. Prof. Hanson*

Alternate Years, Winter Quarters

72.903 Medicinal Chemistry Thesis (2-6 q.h.)*Prep. Written permission of instructor. Staff*

Yearly, All Quarters

72.904 Ph.D. Dissertation (0 q.h.)*Prep. Written permission of instructor. Staff*

Yearly, All Quarters

73.814 Concepts in Pharmacology I (2 q.h.)

In-depth coverage of the fundamental principles of pharmacology. The course covers pharmacodynamics, including dose-effect relationships and drug-receptor interactions. Pharmacokinetic concepts, including absorption, distribution, and elimination will be presented as well as common pathways of drug metabolism. Other topics to be discussed include pharmacogenetics, drug resistance, tolerance and physical dependence. An overview of experimental and clinical drug evaluation in humans will be presented. The course is intended as a necessary prerequisite for

succeeding courses in pharmacology and toxicology. *Prep. Admission to a graduate department or approval of the instructor. Prof. Blumberg*
Yearly, Fall Quarter

73.815 Concepts in Pharmacology II (2 q.h.)

A study of the physiological principles and concepts that are essential for understanding the effects of drugs acting on the peripheral nervous system. In addition to the therapeutic uses and actions of various drug classes, attention is focused on the use of drugs as tools to investigate nervous system functions. *Prep. 73.814. Prof. Kosersky* Yearly, Winter Quarter

73.816 Concepts in Toxicology I (2 q.h.)

An overview of toxicology describing the elements of method and approach that identify the science. Special emphasis is placed on the systemic site of action of toxicants. The intent of this part of the course is to provide answers to two questions: 1) What kinds of injury are produced in specific organs or systems by toxic agents? 2) What are the agents that produce these effects? *Prep. 73.814. Prof. Blumberg* Yearly, Winter Quarter

73.817 Concepts in Toxicology II (2 q.h.)

Continuation of Concepts in Toxicology I. *Prep. 73.816.*
Yearly, Spring Quarter

73.818 Special Topics in Pharmacology (2 q.h.)

Concepts and current research activity in a variety of areas, including autonomic, renal, cardiovascular, and endocrine pharmacology; chemotherapy; blood; and pharmacological aspects of immunity and allergy. *Prep. 73.815.* Yearly, Fall Quarter

73.820 Environmental Toxicology (2 q.h.)

The problems of toxic disturbances and distortions of our biosphere are discussed. When appropriate, the mechanism of action of toxic agents and the basis for their selectivity will be examined. Toxic agents are grouped by chemical or use characteristics such as pesticides, food additives, metals, social poisons, chemical carcinogens, teratogens and mutagens. This course will attempt to provide perspective for the nontoxicologist to the application of the results of toxicologic investigation and a better understanding of those chemicals which, in ever-increasing amounts, threaten the health, comfort or quality of life. *Prep. Admission to a graduate department or approval of the instructor. Prof. Neumeyer* Yearly, Spring Quarter

73.822 Pathology (2 q.h.)

The student is introduced to the study of the nature of disease, emphasizing the general mechanisms and pathogenesis. Of paramount importance is the effect of disease on the human body. The language of disease is

stressed. Basic principles of disease processes and more common special diseases are extensively covered. A research paper may be assigned at the discretion of the instructor. *Prep. Anatomy and Physiology.*

Prof. Loconte

Yearly, Spring Quarter

73.829 Experimental Pharmacology (2 q.h.)

Principles and applications of pharmacological methods used to evaluate drug action. *Prep. 73.814 or consent of instructor. Prof. Kosersky, Prof. Spector, and Prof. Deth*

Alternate Years, Spring Quarter

73.835 Neuropharmacology (2 q.h.)

Selective topics in the field of neuropharmacology are discussed to provide insight into the technical aspects of performing neuropharmacological research. Drugs of therapeutic interest, as well as drugs of abuse, will be emphasized. *Prep. 73.814 Concepts of Pharmacology I. Prof. Howes*

Yearly, Spring Quarter

73.844 Drug Metabolism (2 q.h.)

Presentation of the current principles and methods for studying the metabolic transformation and physiological disposition of drugs and other chemicals of pharmacological and toxicological interest. The chemistry of Phase I and Phase II reactions from a mechanistic and empirical viewpoint is covered. The role of structure, bonding, molecular configuration, substitution, and related physiochemical factors in the enzymatic reaction is assessed. The effects of enzyme induction and other factors such as species, sex and age on the extent of metabolism are explored. *Prep. 72.814 or permission of instructor. Prof. Kuttub, Prof. Shargel*

Yearly, Winter Quarter

73.845 Radioisotopes in Biological Systems (2 q.h.)

Methodology of radioactive nuclides and application of these isotopes to biology and medicine, with special emphasis on their use in clinical analysis. *Prep. consent of instructor. Prof. Davis*

Yearly, Spring Quarter

73.870 Pharmacology Seminar (2 q.h.)

Discussion of current topics of interest in the field of Pharmacology. *Prep. 73.814. Prof. Kosersky and Prof. Deth*

Yearly, Spring Quarter

73.871 Research Report in Pharmacology I (2 q.h.)

A selected research project is undertaken by the student under the direction of a faculty member. *Prep. 73.870. Prof. Kosersky*

Yearly, All Quarters

73.872 Research Report in Pharmacology II (2 q.h.)

A continuation of 73.871. *Prep. 73.871. Prof. Kosersky*

Yearly, All Quarters

87.810 Functions of the Human Systems (2 q.h.)

Histology and physiology of respiratory, urogenital, endocrine, nervous, and digestive systems. Lectures supplemented by current research articles and student reports. *Prep. Biology, Chemistry, Prof. Gozzo and Prof. Davis*
Yearly, Fall and Winter Quarters

87.811 Pathophysiology I (2 q.h.)

Disease processes as variants, inappropriate and appropriate, of normal physiological functions; a detailed examination of certain important and illustrative diseases rather than a survey or catalogue of diseases in general. *Prep. Mammalian physiology; knowledge of biochemistry is helpful.*
Prof. Marglin Yearly, Winter Quarter

87.812 Pathophysiology II (2 q.h.)

A continuation of 87.811 Pathophysiology I. *Prep. 87.811. Prof. Marglin*
Yearly, Spring Quarter

87.816 Principles of Hematology and Coagulation Related to Transfusion (3 q.h.)

This course includes lectures and laboratory experience dealing with hemoglobins, iron metabolism, blood formation, blood volume functions of circulating cells, anemias, leukemias and lymphomas, coagulation theories, factors and disorders. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.202 and permission of the instructor.*
Prof. Kim Yearly, Spring Quarter

87.821 Medical Laboratory Management I (2 q.h.)

This course was developed to allow medical technologists to prepare themselves for managerial responsibilities. Participants are introduced to basic skills and knowledge appropriate to the administration of a medical laboratory rather than specialized functional techniques. The basic objectives of the concentration are: to confront the student with appropriate learning experiences, to increase skills and knowledge in basic disciplines underlying administrative practice, and to develop judgment and skills in problem analysis and decision making in organizations. Major topics to be discussed include: supervision, operations, organizations, productivity, quality control, human behavior, communications, personnel management, and environment. *Prep. Medical laboratory experience or consent of instructor. Mr. Moy*
Yearly, Winter Quarter

87.822 Medical Laboratory Management II (2 q.h.)

A continuation of 87.821 Medical Laboratory Management I. Major topics to be discussed include: accounting, budgeting, purchasing, reimbursement, legalities, marketing, planning, and politics. *Prep. 87.821 or consent of instructor. Mr. Moy*
Yearly, Spring Quarter

87.826 Health Science Education I (2 q.h.)

An overview of various aspects of education in the health-related professions to include: design and use of behavioral objectives, evaluation tools (both clinical and didactic), and a survey of various teaching methods. Current journal literature will supplement lecture material. *Prep. Health Professions Major. Prof. Barr* Alternate Years, Fall Quarter

87.827 Health Science Education II (2 q.h.)

Various types of learning packages or self-instructional aids are examined. With the aid of lecture material and independent assignment, each student will design and produce a fifteen-minute autotutorial and will present it to the class for critique. Current journal literature will also be used. *Prep. 87.826. Prof. Barr* Alternate Years, Winter Quarter

87.828 Health Science Education III (2 q.h.)

Application of learning theory to health science education in teaching didactic and psychomotor skills. Each student will be responsible for presenting one 15-minute unit to the class and to teach one session of an actual class to undergraduate students. Each unit will include defining objectives, selecting evaluation tools, and determining the appropriate instructional technique. *Prep. 87.827. Prof. Barr* Alternate Years, Spring Quarter

87.832 Hematology I—Disorders of the Erythrocytes (2 q.h.)

A detailed examination of the physiology and pathology of red blood cells and hemoglobin. *Prep. Some knowledge of basic hematology is essential, and familiarity with general mammalian biochemistry is strongly recommended. Prof. Marglin* Yearly, Fall Quarter

87.833 Immunobiology (2 q.h.)

Lectures include topics of current interest in immunobiology, such as organ transplantation, immune tolerance, enhancing and blocking factors, and the immunology of cancer. *Prep. consent of instructor. Prof. Gozzo* Yearly, Spring Quarter

87.842 Hematology II—Disorders of the Leukocytes (2 q.h.)

The pathophysiology of white cell disorders. Clinical and laboratory correlations of leukemias, myeloproliferative and lymphoproliferative disorders, infections, and inherited leukocyte anomalies. *Prep. undergraduate Biochemistry. Prof. Gabig* Yearly, Winter Quarter

87.843 Immunobiology Laboratory (2 q.h.)

Students are required to undertake individual research projects relating to topics covered in lecture. *Prep. consent of instructor. Prof. Gozzo* Yearly, Spring Quarter

87.845 Epidemiology (2 q.h.)

Basic concepts of epidemiology, causes of disease, factors contributed by

agents, the human host, and the environment. Acquisition and evaluation of data. Relationship of person, time, and place. Case studies and problems. *Prep. Consent of Instructor. Prof. Jackson* Yearly, Winter Quarter

87.852 Hematology III—Coagulation (2 q.h.)

Clinical and laboratory correlations of coagulation disorders. The use of factor analysis in diagnosis of coagulation disorders. *Prep. undergraduate biochemistry, hematology course or experience. Prof. Davis* Yearly, Spring Quarter

87.857 Cellular Pathology I (2 q.h.)

A survey of the cell and its components, with emphasis on lesions in cellular function and their causes. Examples will be drawn from both prokaryotes and eukaryotes. *Prof. Bhatnagar* Yearly, Winter Quarter

87.858 Cellular Pathology II (2 q.h.)

Control mechanisms, with emphasis on cancer and other cellular abnormalities. *Prep. 87.857. Prof. Bhatnagar* Yearly, Spring Quarter

87.870 Immunohematology Administration (2 q.h.)

This course includes lectures and experience dealing with standards for blood banks and transfusion services (federal, state, AABB); requirements for state, FDA, and NIH (BOB) licensing; the American Blood Commission; inspection and accreditation donor procurement; interbank blood exchange; organization of blood bank and transfusion service; medical and legal aspects of transfusion practice; design of physical facilities; evaluation, selection and maintenance of equipment; evaluation and selection of supplies and reagents; preparation; labeling requirements; quality control systems; proficiency testing programs; record keeping; computer principles, use of computer facilities; operations of donor facilities and blood bank laboratories. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.202 and permission of instructor. Prof. Kim* Yearly, Fall Quarter

87.871 Immunohematology Administration Laboratory (2 q.h.)

This course includes laboratory experience dealing with standards for blood banks and transfusion services (federal, state, AABB); requirements for state, FDA, and NIH (BOB) licensing; the American Blood Commission; inspection and accreditation donor procurement; interbank blood exchange; organization of blood bank and transfusion service; medical and legal aspects of transfusion practice; design and physical facilities; evaluation, selection and maintenance of equipment; evaluation and selection of supplies and reagents; preparation; labeling requirements; quality control systems; proficiency testing programs; record keeping; computer principles, use of computer facilities; operations of donor facilities, and blood bank laboratories. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.202 and permission of instructor. Prof. Kim* Yearly, Fall Quarter

87.872 Transfusion Therapy (2 q.h.)

This course includes lectures dealing with selection of blood donors, phlebotomy and pheresis procedures, processing requirements, donor reaction, blood components, physical characteristics of stored blood, indications for transfusion, transfusion reaction, therapeutic phlebotomy and pheresis, autologous transfusions, pediatric transfusions, massive blood replacement, extracorporeal perfusion, cardiopulmonary bypass, and dialysis. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.202 and permission of instructor. Prof. Kim*

Yearly, Fall Quarter

87.873 Transfusion Therapy Laboratory (2 q.h.)

This course includes laboratory experience with selection of blood donors, phlebotomy and pheresis procedures, processing requirements, donor reaction, blood components, physical characteristics of stored blood, indications for transfusion, transfusion reaction, therapeutic phlebotomy and pheresis, autologous transfusions, cardiopulmonary bypass, and dialysis. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.202 and permission of instructor. Prof. Kim*

Yearly, Fall Quarter

87.874 Genetic and Immunologic Aspects of Blood Group Identification (1 q.h.)

This course includes lectures dealing with immune response, physical chemistry of immunohematological tests, immunological diseases, tests for detection and identification of antibodies and antigens, principles of human genetics, blood group genetics, and population and family studies. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.202 and permission of instructor. Prof. Kim*

Yearly, Winter Quarter

87.875 Genetic and Immunological Aspects of Blood Group Identification Laboratory (1 q.h.)

This course includes laboratory experience dealing with immune response, physical chemistry of immunohematological tests, immunological diseases, tests for detection and identification of antibodies and antigens, principles of human genetics, blood group genetics, and population and family studies. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.202 and permission of the instructor.*

Prof. Kim

Yearly, Winter Quarter

87.876 Principles and Foundations of the Blood Group Systems (2 q.h.)

This course includes lectures and experience with the human blood group systems, their antigens and antibodies, genetic inheritance and interactions, frequencies, mutants and alterations by disease states, and blood group testing. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.874, 87.875 and permission of the instructor. Prof. Kim*

Yearly, Winter Quarter

87.877 Principles and Foundations of the Blood Group Systems Laboratory (2 q.h.)

This course includes laboratory experiences with the human blood systems, their antigens and antibodies, genetic inheritance and interactions, frequencies, mutants and alterations by disease states, and blood group testing. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.874, 87.875 and permission of the instructor. Prof. Kim* Yearly, Winter Quarter

87.878 The Design and Problems of Compatibility Testing (1 q.h.)

This course includes lectures and experience with the design and purpose of compatibility testing; factors complicating compatibility procedure; techniques employed in compatibility testing; leukocyte, platelet and tissue compatibility; and special crossmatch and transfusion procedures. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.874, 87.875, 87.876, 87.877 and permission of the instructor. Prof. Kim* Yearly, Spring Quarter

87.879 The Design and Problems of Compatibility Testing Laboratory (2 q.h.)

This course includes laboratory experience with the design and purpose of compatibility testing; factors complicating compatibility procedures; techniques employed in compatibility testing; leukocyte, platelet and tissue compatibility; and special crossmatch and transfusion procedures. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.874, 87.875, 87.876, 87.877 and permission of the instructor. Prof. Kim* Yearly, Spring Quarter

87.890 Seminar (1 q.h.)

Topics to be announced quarterly. Yearly, Fall, Winter and Spring Quarters

87.990 Graduate Research Report I (2 q.h.)

Research of a special topic in medical laboratory science, involving individual research, is undertaken and reported. Under the direction of a faculty member. *Prep. written permission of instructor.*

Yearly, All Quarters

87.991 Graduate Research Report II (2-4 q.h.)

Continuation of 87.990. *Prep. 87.990.*

Yearly, All Quarters

87.992 MLS Thesis (2-6 q.h.)

Prep. Written permission of instructor.

Yearly, All Quarters

90.821 Biochemistry I (2 q.h.)

Description of the components of biochemistry, including the chemistry of carbohydrates, lipids, prostaglandins, steroid hormones, amino acids, polypeptides, proteins, purines, pyrimidines, nucleosides, and nucleic

acids. Consideration of Henderson-Hasselbalch expression, buffers, and importance of pKa. *Prep. two quarters of Organic Chemistry.*

Prof. Rosowsky

Yearly, Summer and Fall Quarters

90.822 Biochemistry II (2 q.h.)

Discussion of enzymes, enzyme kinetics, and mechanisms of enzyme reactions. An introduction to the methods used for intermediary metabolism, bioenergetics, biological oxidation-reduction reactions, and the electron transport chain. A consideration is made of carbohydrate metabolism, including the citric acid cycle, the Embden Meyerhoff pathway, and the pentose phosphate pathway. Use of isotopes in biochemistry and the role of high-energy phosphate compounds are outlined. *Prep. 90.821.*

Yearly, Summer and Winter Quarter

90.823 Biochemistry III (2 q.h.)

Lipid metabolism is presented, including the fatty acid cycle, the biosynthesis of fatty acids, and the biological formation of the prostaglandins, cholesterol, and steroid hormones. The metabolism of the various amino acids is considered, including the urea cycle, one-carbon fragments, transamination reactions, and aromatic hydroxylations. Metabolism of nucleic acids and their building blocks are discussed, as well as the genetic basis of protein synthesis, the genetic code, and the mechanisms of control.

Prep. 90.822.

Yearly, Spring Quarter

90.824 Applications of Mass Spectrometry (2 q.h.)

A comprehensive examination of the principles governing the fragmentation of organic molecules, the interpretation of mass spectra and discussion of applications of mass spectrometry to the solution of selected problems in the fields of chemistry, biochemistry and forensic sciences. *Prep. 1 year Organic Chemistry, Basic Physics, Physical Organic Chemistry desirable but not essential. Prof. Vouros*

Yearly, Summer Quarter

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Northeastern University 1978-79

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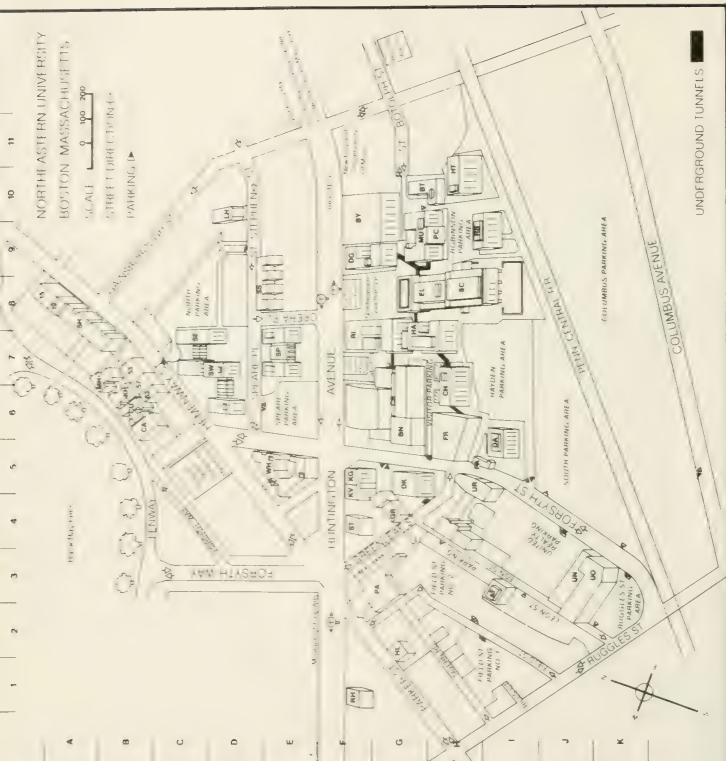
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Academic and Service Buildings

Academic and Service Buildings	Map Code	Bldg Code
African-American Institute	G3	AF
Bancroft Auditorium	G6	BN
Biology Building	G10	BT
Center for Physical Education	G6	CB
Cabners Hall	C6	CA
Churchill Hall	H6	CH
Cushing Hall	B6	CJ
Dana Research Center	I5	DA
Dockster Hall	G5	DK
Dodge Library	G9	DG
Eli Student Center (Auditorium section)	G8	EL
Eli Student Center (Student Lounge section)	H8	SC
Forsyth Building	H6	FR
Forsyth Building Annex	H5	FA
Greenleaf Building	G4	GR
Hayden Hall	G7	HA
Hillel House	G1	HL
Hurtig Hall	H11	HT
Kerr Hall (Faculty Center)	B6	KH
Knowles Center (Gryzmish Hall)	F5	KG
Knowles Center (Volpe Hall)	F5	KV
11 Leon Street	J3	UO
15 Leon Street	J3	UN
Mugar Life Sciences Building (Peabody Health Professions Center)	G9	MU
Parker Building	G3	PA
Peabody Center	G9	PC
Richards Hall	F7	RI
Robinson Hall	H10	RB
Searns Center	F4	ST
United Realty Building	H5	UR
Residence Facilities		
Boston YMCA	F10	BY
115 Hemenway Street	A8	15
119 Hemenway Street	A8	19
153 Hemenway Street	B7	53
157 Hemenway Street	B6	57
163 Hemenway Street	C6	63
Kerr Hall	B6	KH
Light Hall	D10	LH
Melvin Hall	B7	MH
Rubenstein Hall	B7	RH
106-122 St. Stephen Street	E8	SS
Smith Hall	B8	SH
Spear Hall	E7	SP
Sielson Hall East	C7	SE
Sielson Hall West	D7	SW
White Hall	E5	WH

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UNDERGROUND TUNNELS

ACADEMIC CALENDAR 1978—1979

Fall Quarter 1978

Registration period		
Burlington	Tuesday—Wednesday	Sept. 12—13
Boston	Monday—Thursday	Sept. 18—21
Classes begin	Monday	Sept. 25
Last day to drop a course	Wednesday	Nov. 22
Examination period	Monday—Saturday	Dec. 11—16

Winter Quarter 1978—79

Registration period		
Burlington	Tuesday	Nov. 28
Boston	Monday—Thursday	Dec. 4—7
Classes begin	Tuesday	Jan. 2
Last day to drop a course	Friday	Mar. 2
Examination period	Monday—Saturday	Mar. 19—24

Spring Quarter 1979

Registration period		
Burlington	Tuesday	Mar. 6
Boston	Monday—Thursday	Mar. 12—15
Classes begin	Monday	Apr. 2
Last day to file card for Spring Commencement	Friday	Mar. 30
Last day to pay fee for Spring Commencement	Tuesday	May 1
Last day to drop a course	Friday	June 1
Examination period	Monday—Saturday	June 11—16
Spring Commencement	Sunday	June 17

Summer Quarter 1979

Registration period		
Burlington	Monday—Tuesday	June 11—12
Boston	Wednesday—Thursday	June 13—14
Classes begin	Monday	June 25
Last day to file card for Fall Commencement	Friday	July 6
Last day to pay fee for Fall Commencement	Wednesday	Aug. 1
Examination period	Wednesday—Thursday	Aug. 1—2

UNIVERSITY HOLIDAYS 1978—79

Columbus Day	Monday	October 9
Veterans Day	Saturday	November 11
Thanksgiving Recess	Thursday—Saturday	November 23—25
Christmas Vacation	Monday—Monday	Dec. 18—Jan. 1
Martin Luther King Day	Monday	January 15
Washington's Birthday	Monday	February 19
Patriot's Day	Monday	April 16
Memorial Day	Monday	May 28
Independence Day	Wednesday	July 4
Labor Day	Monday	September 3

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer and/or the Title IX coordinator.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. Radio stations WBZ, WEEI, WHDH, WJDA, WCOP, WRKO, WLYN, WKOX, WHAV, and WLLH will announce the University's decision to close.

In addition, the University maintains an emergency snow phone (262-SNOW). Whenever in doubt, call 262-SNOW and a taped message will indicate the status of classes.

Important Note to Students

The Northeastern University catalog contains *current information* regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

We at Northeastern will do our best to make available to you the finest education we can provide, the most stimulating atmosphere in which to learn, and the most congenial conditions under which you may enjoy the learning experience. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. You will be a full participant in an educational partnership. We will and, indeed, can only make the opportunities available to you; it is up to you to take advantage of them.

This is equally true with your career upon graduation. We cannot guarantee that you will obtain any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state. While we will be ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because we cannot know what your expectations and understandings are unless you tell us.

In brief, what we are saying to you is that we are here to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.



the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The state legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of about 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses—offered by the University since 1906—and adult day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate School of Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degrees of Master of Education and Doctor of Education, and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs include seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intra-state lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The 50-acre campus is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering; Chemistry and Biology; Mathematics and Psychology; and Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 404,000 volumes supplemented by some 452,300 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 4,000 periodical titles, 100,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts, 12 miles from the main campus. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups.

the graduate school of education

The Graduate School of Education provides programs leading to the Master of Education degree for individuals who wish to pursue an educational specialization or related area of study. A nondegree program for students who wish to take courses toward certification as elementary or secondary teachers is also offered. Certification of professional educators is at the prerogative of the respective states. Most states grant certification when a person demonstrates completion of a specific set of courses or a program approved by some professional or state agencies. The college may help the student by assisting in identifying requirements and providing materials and experiences needed in application for certification. Some requirements vary from state to state and it is the student's responsibility to obtain information relevant to the specific position for which application for certification is intended.

Individuals who possess or are eligible for teaching certificates may earn the Master of Education degree in the areas of curriculum and instruction, early childhood education, elementary and secondary administration, moderate special needs, instructional technology, occupational and career education, severely handicapped, and early childhood handicapped.

Individuals who do not possess a teaching certificate may specialize in the areas of career education and college counseling, community counseling, cooperative education, rehabilitation counseling, school counseling, educational research, human development, international education, rehabilitation administration, speech pathology or audiology, and special education community personnel.

Programs of study leading to the Certificate of Advanced Graduate Study in the areas of counseling, curriculum and instruction, educational administration, rehabilitation, and special education are offered to individuals who presently hold a master's degree and appropriate certification where necessary.

The Graduate School of Education also offers a Doctor of Education (Ed.D.) program in Leadership: Administration and Supervision. Being offered jointly by the Departments of Counselor Education, Educational Administration, and Special Education and Rehabilitation Administration, concentrations are available in the areas of school administration, rehabilitation administration, pupil personnel administration, student personnel administration, administration of higher education, administration of cooperative education, and special education administration. Students must hold a master's degree and appropriate certification where necessary in order to apply to this program.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the council. The regulations and academic requirements which follow have been formulated in accordance with this general policy. Students desiring consideration of a variation of existing policy may petition the Committee of the Graduate School of Education.

Registration

Students must register within the period listed on the school calendar. Time and place of registration will be announced prior to each period.

Residence

All work for advanced degrees must be completed at the University unless approval has been obtained from the Director of the Graduate School for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

Grading System

The performance of students in graduate courses will be recorded by the instructor, using the following grades:

A Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory

This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I Incomplete

This grade is given to those students who fail to complete the work of the course.

L Audit without credit.

S Satisfactory without quality designation.

U Unsatisfactory without quality designation.

Grades S and U are used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence.

The I grade will be changed to a letter grade upon removal of the deficiency that caused the grade of I to be reported. Deficiencies must be made up within the quarter following that for which the grade of I is received unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters.

Any student who wishes to take a final make-up examination must obtain permission of the Director of the Graduate School by the second week of the quarter succeeding that in which the examination was missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission of the Director to defer it to one of the next two quarters.

Auditing

A student may audit a course without credit by obtaining, prior to registration, the written approval of the instructor of the course involved and by presenting this permit at the Office of the Graduate School of Education. No change either to or from the audit status may be made after the first day of classes. Tuition for an audit course is the same as for a course taken for credit.

Class Hours and Credits

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three-fourths a semester hour credit. The academic calendar at the front of this bulletin should be consulted in order to determine the opening and closing dates of each quarter. It should be noted that most classes meet either in the late afternoon or evening.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who has been admitted to a degree program, has completed at least one course but has not attended for a period of one year, must submit to the Office of the Graduate School of Education a written request for reinstatement to the program. After receiving formal notification or reinstatement, students must meet with their program adviser to make any necessary program adjustments.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Burlington Campus Office. Withdrawals may be made through the ninth week of the quarter. Students will be withdrawn as of the date on which the form is returned to the Office of the Registrar, Room 120 HA. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal. See section on financial information for information on refunds.

Academic withdrawals from the Graduate School of Education are made by the Director when students fail to meet the academic requirements.

Changes in Requirements

The continuing development of the graduate school can force frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Application for the Degree

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed on the calendar, there is no assurance that the degree will be granted in that particular year even though all other requirements have been fulfilled.

Honor Society

Northeastern University has on campus the Kappa Zeta Chapter of Kappa Delta Pi. A national honor society in education, Kappa Delta Pi was founded in 1911 at the University of Illinois. Kappa Zeta Chapter was installed on May 29, 1964.

To be considered for membership, graduate students must be degree candidates in the College of Education and have completed at least six courses (24 quarter hours) with a cumulative average of at least 3.5, and have no C grades on their graduate records.

Applications for membership and further information may be received from the Office of the Dean, College of Education, Northeastern University, Boston, MA 02115.

Supporting Services

The College of Education operates or coordinates with other agencies in the operation of certain bureaus, clinics, and offices which support and enrich the academic programs. Graduate students may find some of these services to be of interest and assistance while others may be suggested as sources of information or practical experiences. Among these services are those discussed in the following paragraphs.

The Bureau of Educational Field Services, located in Cahners Hall, 110 The Fenway, provides a wide variety of offerings to our graduate students as well as to school systems and other educational agencies throughout New England. These offerings include special off-campus programs for our graduate students, both credit and noncredit; credit and noncredit in-service training for professional school personnel, offered in local communities; special noncredit workshops for parent and paraprofessional

groups; and program evaluation, research projects, surveys, educational planning services, and consultant services.

Anyone interested in obtaining more information about the Bureau should contact the Office of the Director of the Bureau at 617-437-3840, or visit 96 Cahners Hall.

Northeastern University's Speech and Hearing Clinic, located in 133 Forsyth Building, provides diagnostic and therapeutic services for both University students and school-age community children insofar as staff and facilities allow. The Clinic is accredited by the Professional Services Board of the American Speech and Hearing Association.

The Curriculum Development Laboratory, located in the Cahners Building, 110 The Fenway, contains a variety of materials and resources related to the programs of the Graduate School of Education. It contains the Library of Children's Literature and examples of elementary and secondary teaching materials and evaluative materials, including published tests. Use of this facility is limited to the staff and students of the College and Graduate School of Education.

Northeastern University's Reading and Learning Clinic, located in Cahners Hall, provides diagnostic and corrective services in reading for both University students and school-age community children insofar as staff and facilities allow.

In addition, the College of Education utilizes the resources, materials, and facilities of other University-wide bureaus such as the Office of Learning Resources, an important component of which is the Center for Programmed Instruction.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition for masters degree candidates, CAGS candidates, doctoral candidates, and special students is \$65 per quarter hour of credit. Tuition for audited courses is the same as for courses taken for credit. There is a special tuition charge of \$745 for the following: 51.805, Student Teaching; 51.873 and 51.875, Reading Clinic I & II; 51.893-894, Seminar in Supervision of Instruction and Practicum; 53.805-806, Counseling Practicum; 53.840-841, Advanced Field Work; 53.843-844, School Psychology Field Work; 55.813, Advanced Clinical Practice; 55.852, Student Teaching of the Hearing Impaired; 56.850-851, Field Work and Student Teaching; 56.853-854, Field Work and Practicum; 56.960, Practicum in Rehabilitation Administration; 93.802-803, Practicum in Early Childhood Education I & II; Thesis.

There is a special tuition charge of \$372.50 for the following: 52.843, Administrative Internship; Counselor Education Interns enrolled in the Boston School System.

The tuition charge for the doctoral dissertation is \$585, to be paid when registering for the dissertation. At the completion of formal course work for the doctorate, a dissertation continuation fee of \$50 per quarter will be charged until completion of the dissertation.

A \$100 nonrefundable tuition deposit, payable upon acceptance into the programs, is required of all full-time students accepted by the Departments of Counselor Education and Speech Pathology and Audiology. This deposit will be applied to the tuition for the first quarter of study.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University on or before the date specified.

Tuition rates and fees are subject to revision by the Board of Trustees at any time.

Fees

An application fee of \$15 (nonrefundable) is charged to all students when they apply for admission to the Graduate School of Education. No application papers will be processed until this fee has been received. Checks should be made payable to Northeastern University and sent to the Graduate School of Education, 102 The Fenway, Boston, Mass. 02115.

Other fees include a charge of \$10 for late payment of tuition; a fee of \$2 for deferred tuition (with approval of Bursar); a fee of \$25 for all degree can-

didates, payable four weeks before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the student center. The fee for teaching assistants and research fellows is \$6.25 each quarter. All part-time students on the Huntington Avenue campus are charged \$.75 a quarter.

All full-time students, including those with assistantships and fellowships, will pay a nonrefundable University health services fee of \$140 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the student to the medical care provided by the University Health Service.

All financial obligations to the University must be cleared before graduation.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Amount of Refund

Official Withdrawal Filed Within:	Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

The Office of Financial Aid offers several types of assistance to eligible graduate students. All awards are based on financial need. Since the majority of these awards are sponsored by the federal government, the amount of aid granted is determined by the amount of funds allocated to Northeastern University each year.

Only students who have been officially accepted as degree candidates may apply for financial aid. In addition, the University only awards financial aid to eligible students who are U.S. citizens and permanent residents of the United States. Students who are studying in the United States on student visas are not eligible for federal assistance.

Northeastern University is a participant in the Graduate and Professional School Financial Aid Service (GAPSFAS). All applicants must file a GAPSFAS in order to be considered for financial aid. All sections of the GAPSFAS, including the parents' section, must be completed and sent to the GAPSFAS, Box 2614, Princeton, New Jersey 08540. Northeastern University also requires a Graduate Student Application. These forms may be obtained in the Office of Financial Aid, 254 Richards Hall.

The following types of assistance are administered by the Office of Financial Aid:

National Direct Student Loan

This program is available to full-time graduate students who *need* a loan to meet their educational costs. Eligible graduate students may borrow up to \$10,000 under this program. Repayment and interest do not begin until nine months after the student ceases to carry at least a half-time academic load at any institution of higher education. Repayment may be extended over a ten-year period with an interest rate of three percent per annum. No payments are required for up to three years while a borrower is serving in the Armed Forces, Peace Corps, or VISTA. Cancellation provisions are available for borrowers who work in certain fields of teaching or specified military duty.

College Work-Study Program

This program is available to full-time graduate students who have financial need. It is designed to give students an opportunity to earn as much as \$3.75 per hour working in jobs on or off campus in public or private non-profit organizations. This program is administered solely by the Office of Financial Aid and should not be confused with the University's Cooperative Education Program.

Guaranteed Student Loan Program

Under this program, students who are matriculated-degree candidates, enrolled for at least *one-half* the normal academic load, may borrow from a participating bank or other financial institution. Terms and conditions of these loans vary from state to state. New federal regulations affecting this program were signed into law on October 12, 1976 (S.2657). In some states, full-time graduate students may borrow up to \$5,000 per academic year. Loan recommendations are based on financial need. Students eligible for Federal Interest benefits are not subject to interest payments until nine months after they cease to carry at least a half-time academic load. Repayment may be extended for as long as ten years with an interest rate of seven per cent per annum. No payments are required for up to three years while a borrower is serving in the Armed Forces, Peace Corps, or VISTA. Information and applications are available from banks, state guarantee agencies, and regional offices of the U.S. Office of Education. Massachusetts residents may contact the Office of Financial Aid for the necessary applications.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr., awards are made as openings occur to qualified minority graduate students who are in need of financial aid and are accepted to full-time study in the

graduate schools of the University. Stipends are available to help cover tuition and fees. Applications for Martin Luther King Scholarships are available at the African-American Institute, 40 Leon Street, Boston, Massachusetts 02115; telephone 617-437-3141.

Dr. Reubin J. Margolin Memorial Scholarship Fund

The Dr. Reubin J. Margolin Memorial Scholarship Fund was established in 1973 through the generosity of the family and friends of Dr. Reubin J. Margolin, an outstanding and dedicated individual and friend who, at the time of his death on April 6, 1972, was Chairman of the Department of Rehabilitation and Special Education at Northeastern University.

The income from the Dr. Reubin J. Margolin Memorial Scholarship Fund is awarded annually to a deserving student admitted to or enrolled in the College of Education or the Graduate School of Education and majoring in Rehabilitation and/or Special Education. Recipients must demonstrate financial need as well as the personal and professional qualities exemplified by Dr. Margolin.

The Office of Financial Aid does not award Graduate Assistantships or Fellowships. For further information regarding such assistance, students should contact their graduate school office.

Graduate Administrative Assistantships

A limited number of assistantships are available, offering the graduate student an opportunity for remission of tuition and a stipend in return for half time spent in assisting with nonteaching duties. In all cases the student must register for a half-time academic load. It is assumed that applicants for such assistantships will be enrolled in a two-year program. Applications may be obtained from the Graduate School of Education, 102 The Fenway, Boston, Massachusetts 02115.

Tuition Assistantships

A limited number of tuition assistantships are available, offering tuition waiver only. Graduate students given this type of appointment may be assigned duties in the department, requiring an average of 8 hours per week. They must register for a full-time academic load. Applications may be obtained from the Graduate School of Education, 102 The Fenway, Boston, Massachusetts 02115.

Teaching Assistantships

Graduate students given this type of appointment may assist in the work of instructional departments or other offices of the University. The appointee may be assigned to class instruction, laboratory supervision, correcting papers and proctoring examinations. Including necessary preparation time, assigned duties require about 18 to 20 hours per week.

The student must register for a half-time academic load. It is assumed that applicants for such assistantships will be enrolled in a two-year program.

Traineeships

Graduate students given these appointments must devote full time to graduate work in accordance with the stipulation of the appointment. These appointments are made from traineeships available from NASA, NSF, NDEA, and other government grants to the University. They may be for 9 to 12 months.

Acceptance Conditions

Northeastern University, which is a member of the Council of Graduate Schools of the United States, subscribes to the following resolution of the Council:

Acceptance of an offer of financial aid (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by an actual or prospective graduate student completes an agreement which both student and graduate school expect to honor. In those instances in which the student accepts the offer before April 15 and subsequently desires to withdraw, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer.

faculty

- Joseph C. Aurelia, B.A., M.A., *Assistant Professor of Speech Pathology and Coordinator of Clinical Services*
- Ronald E. Baptiste, A.B., Ed.M., Ed.D., *Associate Professor of Education*
- Joseph E. Barbeau, B.S., M.Ed., Ed.D., *Professor of Education*
- Dorothy I. Bickling, B.S., M.A., Ed.D., *Assistant Professor of Education*
- Roberta Black, M.Ed., C.A.G.S., *Lecturer in Education*
- Phyllis R. Bowman, B.A., M.Sc., Ed.D., *Assistant Professor of Education*
- Richard Brown, B.S., M.Ed., *Lecturer in Education*
- Wendell R. Brown, B.A., LL.B., D.S.S., *Associate Professor of Education*
- Nicholas J. Buffone, B.A., M.Ed., Ph.D., *Associate Professor of Education*
- Leslie Burg, B.S., M.Ed., Ed.D., *Associate Professor of Education*
- Robert S. Butters, A.B., M.Ed., Ed.D., *Associate Professor of Education and Acting Director of Office of Field Placement*
- Russell J. Call, B.Ed., M.A., Ed.D., *Associate Professor of Education, and Chairperson, Department of Curriculum and Instruction*
- Adeline Cannamella, M.Ed., *Lecturer in Education*
- Lydia Casavant, B.A., M.S.W., *Lecturer in Education*
- Thomas H. Clark, B.A., M.A., *Assistant Professor of Education*
- Arthur Davis, Jr., B.S., M.A., Ph.D., *Associate Professor of Education*
- James Deleppo, B.A., Ed.M., Ed.D., *Lecturer in Education*
- Robert H. Dimitri, B.A., Ed.M., *Lecturer in Education*
- Lillian Dinklage, B.A., M.Ed., Ed.D., *Lecturer in Education*
- Irvin Doress, B.A., M.A., Ed.D., *Associate Professor of Education*
- Philip Dunphy, B.A., M.Ed., *Lecturer in Education*
- E. Lawrence Durham, A.B., M.A., *Professor of Education*
- Robert J. Ferullo, B.S.B.A., Ed.M., Ed.D., *Professor of Speech Pathology and Audiology and Chairperson, Department of Speech Pathology and Audiology*
- Jeffrey Fine, B.A., M.A., *Lecturer in Education*
- Mina B. Ghattas, B.A., M.Ed., Ph.D., *Associate Professor of Education and Director of Office of Learning Resources*
- George J. Goldin, B.S., M.S., Ph.D., *Professor of Special Education*
- Diana S. Gondek, B.A., J.D., *Lecturer in Education*
- Robert Gracia, B.A., M.Ed., *Lecturer in Education*
- H. Andrew Graham, B.A., M.A., R.N., Ed.D., *Lecturer in Education*
- Joan Green, B.A., M.Ed., *Lecturer in Education*
- Arlene Greenstein, B.A., M.S., Ph.D., *Assistant Professor of Speech Pathology*
- E. Vaughn Gulo, A.B., M.A., Ed.D., *Professor of Education*
- Charles F. Haley, B.S., M.Ed., *Associate Dean of Education*
- Cheryl C. Hanks, A.B., A.M., Ph.D., *Associate Professor of Education*

- Martin S. Hanopole, B.S., M.A., Ph.D., *Assistant Professor of Speech Pathology*
- Thomas F. Harrington, B.A., M.Ed., Ph.D., *Professor of Education*
- Robert W. Hayes, B.A., Ed.M., Ed.D., *Lecturer in Education*
- Thomas F. Henstock, B.A., M.A., Ed.M., Ed.D., *Associate Professor of Education*
- John D. Herzog, B.A., M.A.T., Ph.D., *Professor of Education and Chairperson, Department of Foundations of Education*
- Melvin Howards, B.S., M.A., Ph.D., *Professor of Education and Director, Reading Clinic*
- Leonard Israel, B.A., M.A., *Instructor in Speech Pathology*
- Sherry R. Israel, B.A., M.A., Ph.D., *Lecturer in Education*
- Maurice Kaufman, B.S., M.S., Ph.D., *Professor of Education*
- Blanche Korngold, A.B., Ed.M., C.A.G.S., *Assistant Professor of Education*
- Albert Kovner, B.S., M.A., Ed.D., *Associate Professor of Education and Acting Chairperson, Department of Educational Administration*
- Louise LaFontaine, A.B., M.A., Ed.M., Ed.D., *Assistant Professor of Special Education*
- Mary J. Lee, B.A., M.Ed., *Associate Professor of Education*
- Terence Lee, B.A., M.Ed., *Lecturer in Education*
- Carlton B. Lehmkuhl, B.S., M.S., Ph.D., *Assistant Professor of Education*
- Matthew H. Luzzi, B.A., M.Ed., C.A.G.S., Ed.D., *Professor of Education and Chairperson, Department of Rehabilitation and Special Education*
- Mervin D. Lynch, B.S., M.S., Ph.D., *Professor of Education*
- John Maguire, A.B., M.Ed., *Assistant Professor of Education*
- Jordan Markson, B.A., M.A., Ed.D., *Lecturer in Education*
- Frank E. Marsh, Jr., A.B., Ed.M., Ed.D., *Professor of Education*
- Lawrence R. Martin, B.A., M.A., M.Ed., *Lecturer in Education*
- Wilbert J. McClure, B.A., M.A., Ph.D., *Assistant Professor of Education*
- JoAnne S. McKay, A.B., Ed.M., *Assistant Professor of Special Education*
- Robert C. McLean, A.B., M.S., Ed.D., *Associate Professor of Education*
- Joseph Meier, Ed.M., Ed.D., *Associate Professor of Education*
- Harold A. Miner, B.S., Ed.M., Ed.D., *Associate Professor of Education and Director, Bureau of Field Services*
- William F. Murphy, B.Mus., M.Ed., Ed.D., *Assistant Professor of Education*
- Albert Muscowitz, B.A., M.S.W., *Lecturer in Education*
- Gilbert G. Neil, A.B., M.S., *Clinic Supervisor, Speech Pathology and Audiology*
- Irene A. Nichols, B.S., Ed.M., Ed.D., *Associate Professor of Education*
- Barbara F. Okun, B.A., M.A., Ph.D., *Associate Professor of Education and Chairperson, Department of Counselor Education*
- Sandra M. Parker, B.A., Ed.M., Ed.D., *Associate Professor of Education*
- Gordon B. Parkhurst, B.A., M.Ed., Ed.D., *Lecturer in Education*
- G. Stanley Patey, B.S., Ed.M., Ed.D., *Lecturer in Education*
- William G. Quill, B.S., M.Ed., Ed.D., *Associate Professor of Education*
- Louis Rappaport, B.A., M.A., Ph.D., *Assistant Professor of Education*

- Robert W. Read, A.B., M.A., Ed.D., *Associate Professor of Education*
- Robert B. Redden, B.S., M.Ed., D.Ed., *Assistant Professor of Audiology*
- Susan E. Rindler, B.A., M.S., Ph.D., *Assistant Professor of Education*
- Phyllis T. Ritvo, B.A., M.Ed., *Lecturer in Education*
- Salvatore J. Rizzo, B.A., M.Ed., Ph.D., *Assistant Professor of Education*
- Maurice J. Rocheleau, B.A., Ed.M., Ph.D., *Lecturer in Education*
- Stanley P. Rosenzweig, B.S., M.A., Ph.D., *Lecturer in Education*
- Stephan B. Ross, B.A., M.Ed., C.A.G.S., *Lecturer in Education*
- Philip J. Rusche, A.B., B.S., M.A., Ed.D., *Associate Dean of Education and
Director of the Graduate School of Education*
- Thomas Francis Ryan, Jr., B.A., M.S.Ed., *Lecturer in Education*
- Judith D. Samuels, B.Ed., M.A., *Lecturer in Education*
- Wendy D. Schneller, B.A., M.S., *Clinical Coordinator & Supervisor, Speech
Pathology*
- Barbara Schram, B.A., M.A., M.S.W., Ed.D., *Assistant Professor of
Education*
- Harold F. Schuknecht, S.B., M.D., *Lecturer in Education*
- James F. Scorzelli, B.S., M.A., Ph.D., *Assistant Professor of Education*
- Morton A. Stone, B.S., Ed.M., *Lecturer in Education*
- Kristine E. Strand, B.S., M.A., *Assistant Professor of Speech Pathology*
- Paul H. Tedesco, A.B., A.M., C.A.G.S., Ph.D., *Professor of Education*
- Benjamin Tessler, LL.B., M.Ed., *Lecturer in Education*
- Joyce P. Vogt, B.A., M.A., *Lecturer in Education*
- Arthur R. Wagman, B.A., Ed.M., Ed.D., *Lecturer in Education*
- Arthur Wallace, B.S., M.S.Ed., *Lecturer in Education*
- Dorothy A. Weber, B.A., M.Ed., *Assistant Professor of Special Education*
- Andrew Whelahan, B.A., M.A., *Lecturer in Education*
- James W. Wilson, B.S., M.A., Ph.D., *Research Professor, Cooperative
Education*
- Alvin D. Zalinger, B.S., M.A., *Associate Professor of Education*
- William G. Zimmerman, Jr., B.S., M.Ed., Ed.D., *Lecturer in Education*

programs of the graduate school of education

MASTER OF EDUCATION

Professional Specializations

School and College Counseling Programs

- Elementary School Counseling
- Secondary School Counseling
- Career Education Specialist
- College Counseling
- Student Personnel
- Cooperative Education Coordinator

Community and Rehabilitation Counseling Programs

- Community Mental Health Counseling
- Rehabilitation Counseling
- Community Services Counseling

Curriculum and Instruction

- English-Language Arts
- General Academic
- Instructional Technology
- Reading
- Science-Mathematics
- Social Studies

Early Childhood Education

- Administration
- Teaching

Educational Administration

- School Administration
- International Experiential Work-Related Education
- Occupational and Career Education Administration

Educational Research

Human Development

Rehabilitation Administration

Special Education

- Early Childhood Handicapped
- Generic Special Educator
- Moderate Special Needs
- Severely Handicapped
- Special Education Community Personnel

Speech Pathology and Audiology

- Audiology
- Education of the Hearing Impaired
- Speech Pathology

**Nondegree Program toward Certification
of Elementary and Secondary Teachers**

CERTIFICATE OF ADVANCED GRADUATE STUDY (CAGS)

Counselor Education

- Pupil Personnel Services Administration
- School Psychology
- Counseling
 - School
 - College
 - Community Mental Health
 - Rehabilitation

Curriculum and Instruction

- Instructional Technology

Educational Administration

- Cooperative Education Administration
- Higher Education Administration
- Instructional Technology Administration
- School Administration

Rehabilitation and Special Education Administration

DOCTOR OF EDUCATION

Counselor Education

- Pupil Personnel Administration
- Student Personnel Administration

Educational Administration

- Cooperative Education Administration
- Higher Education Administration
- School Administration

Rehabilitation and Special Education

- Rehabilitation Administration
- Special Education Administration

**GENERAL REGULATIONS OF THE
GRADUATE SCHOOL OF EDUCATION**

**Master of Education Degree
Certificate of Advanced Graduate Study**

Admission to Degree Candidacy

An applicant for the master's degree must have earned a bachelor's degree from an accredited institution and must complete all admissions procedures as described. An applicant for the Certificate of Advanced Graduate Study must hold a master's degree from an accredited institution and must complete all admissions procedures as described.

An applicant for graduate study in a master's degree program or a CAGS

program should have all the following material on file in the office of the Graduate School of Education three weeks (two months for full time) prior to the beginning of classes in any given quarter. (Applicants for programs in Counselor Education and Special Education must have all material on file by April 15 and April 1, respectively.)

1. Two completed application forms.
2. Two official transcripts from all colleges or universities attended.
3. Three references.
4. An official copy of the Miller Analogies Test (MAT) score.
5. Graduate Record Examination scores (aptitude test only) for applicants with 25% or more pass-fail grades.
6. For CAGS applicants, a record of an interview with the chairperson of the department to which they are applying.
7. For applicants whose native language is not English, an official copy of the results of the Test of English as a Foreign Language (TOEFL).

The Graduate School of Education may require a preadmission conference with any applicant. Applicants may at any time request a conference with the Director of the Graduate School of Education or the Director's designee.

Application Fee

All applications for admission must be accompanied by an application fee (nonrefundable) of \$15. No application will be processed until the fee has been received by the Graduate School of Education. Checks should be made payable to Northeastern University and sent to the Graduate School of Education, 102 The Fenway, Boston, Massachusetts 02115.

Confirmation

Applicants must confirm acceptance to a program within the designated period of time. If confirmations are not received, places in the program will be offered to other applicants.

Students who have confirmed acceptance to a program but who have not initiated their programs within four quarters of admission will be withdrawn from the Graduate School of Education.

Full-time Study

A full-time student must take a minimum of three courses in all quarters except the summer session, during which he must take a minimum of two courses. Enrollment in an additional course in any quarter must be approved by the adviser.

Part-time Study

A part-time student may enroll in a maximum of two courses in any given quarter.

Program Selection and Registration

Upon acceptance as a degree candidate, students will be assigned an adviser in their major area of study. After notification of acceptance by the Graduate School of Education, students must confer with the adviser regarding their program of studies and initial course registration. The student's initial program and any subsequent changes may develop only as a result of the written recommendation of the adviser.

Initial registration will be allowed only upon presentation of a "Permit to Register" card.

Special Student Status

Applicants who have earned a bachelor's degree from an accredited institution and who acknowledge that they do not wish to pursue a degree may be accepted as special students. Special students may register for a maximum of three courses, (not more than two during one quarter) provided that they submit an application form, accompanied by an application fee of \$15, and an official transcript three weeks prior to the beginning of classes. Academic credit earned in such study may not be used to fulfill degree requirements in the Graduate School of Education unless applicants are accepted as a degree candidate and the courses are applicable to their program. Special students may be considered for degree candidacy only upon full presentation of application materials and a formal petition to the Director of the Graduate School of Education.

Academic Classification

1. *Regular* Applicants who meet in full the criteria for immediate matriculation are classified as regular students.
2. *Provisional* Some applicants who do not meet regular admissions standards may be admitted as provisional students. Such students must maintain a B average in their first twelve quarter hours of work in order to continue in the graduate program. Provisional students admitted for part-time study may take only one course in their first quarter of study.
3. *Special* See above.

Programs of Study

The curricula of the programs for the Master of Education degree are given on pages 35-63.

Programs are available for students with or without regular teaching certification. Those with certification may major in the professional specializations listed on page 34.

Students without certification may pursue a Master of Education degree program for which certification is not mandatory (as indicated on page 34)

or if able to devote full time to graduate study may apply for a combined program as described on page 64.

A nondegree program toward certification of elementary and secondary teachers is available as described on page 63.

Information about the programs for the Certificate of Advanced Graduate Study is given on pages 64-73 and about the doctoral program on pages 73-74.

Qualifying and Comprehensive Examinations

Master's degree students may be required by a department to take a comprehensive examination. Unsatisfactory performance in such an examination constitutes grounds for withholding the degree.

CAGS students may be required to take a qualifying examination. All CAGS students are required to satisfactorily complete a comprehensive examination in order to qualify for the certificate.

Academic Requirements

In order to qualify for the Master's Degree in Education and the Certificate of Advanced Graduate Study, an average grade of B must be obtained in all courses. No additional course credits may be allowed in order to satisfy the B average required for the degree.

No student who receives a grade of less than B in three or more courses will be permitted to continue in the program. A student who has accumulated two grades of C from the same faculty member may not register for a third course with this faculty member.

Students who receive a grade of F in a course must make up the course in accordance with the recommendation of their adviser. A student who receives a grade of F in two courses will not be permitted to continue in the program.

Credit and Course Requirements

In satisfying the requirement for a minimum of 40 quarter hours, a student's program must include at least 12 courses which apply to the degree or certificate.

Transfer Credits

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree and the Certificate of Advanced Graduate Study, provided that the credits are recommended for transfer by the student's adviser, consist of work taken at the graduate level for graduate credit, carry grades of A or B, have been earned at an accredited institution, and have not been used toward any other degree. Students should petition the Director of the Graduate School in writing for all transfer credit by completing the necessary form, obtainable from either the office of the Graduate School of Education or the faculty adviser. The

completed form must be submitted to the Director of the Graduate School of Education along with an official transcript and an excerpt from the catalog describing the course.

No transfer form will be considered complete without the signature of the student's adviser or department chairperson. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

Students will be informed in writing when transfer credit has been officially awarded.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years.

NONDEGREE PROGRAM TOWARD CERTIFICATION OF ELEMENTARY AND SECONDARY TEACHERS

Admission

Applicants for this program must follow the admissions procedures as described on page 27 and meet the admissions requirements for the Master of Education degree. In addition, applicants whose backgrounds may not include an approved course in such areas as human development or learning must take such a course either before they enter the program or before student teaching. Candidates expecting secondary certification must have completed, before admission, at least 36 quarter hours of courses in the field in which they are preparing to teach, with a QPA for all courses taken in that field of at least 2.000.

Academic Requirements

In order to qualify for student teaching, students must have completed the four required courses with a B average, and be recommended by their major adviser.

Students may repeat a course in which they received a grade of C or F, and the second grade will govern. However, only one course may be repeated on this basis.

DOCTOR OF EDUCATION DEGREE

Admission

Applicants for admission to the Doctor of Education degree program must file evidence of a master's degree or its equivalent from an accredited institution and such other materials as required by the Graduate School of Education. Materials will be accepted from applicants who are currently enrolled in graduate studies and who expect to obtain the master's degree within two terms of the time of application.

Students who have graduated from or are currently enrolled as regular

CAGS students in the Graduate School of Education may apply for the doctoral degree program. Although most CAGS course work is applicable, there are different admissions criteria and formal application must be made. Conversely, regular doctoral students who either choose not to complete the doctoral program or are disqualified from continuing may make formal application to transfer to the CAGS program.

As part of the application procedure, the applicant must declare a major field of specialization, submit a written statement of purpose for pursuing doctoral study, and if requested, meet with an admissions committee for further evaluation. Application to the Doctor of Education degree program will be acted upon once a year. Application materials must be completed by March first of the year the student intends to matriculate. Notification of the admission status will be provided by April 15.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. Doctoral Student

Students in this classification have been accepted for doctoral study, but have not yet passed the qualifying examination.

2. Doctoral Degree Candidates

Students in this classification have completed forty-eight quarter hours of graduate work and have passed the qualifying examination.

Academic Requirements

In order to qualify for the Doctor of Education degree, an average grade of B must be obtained in all courses. No additional course credits will be allowed in order to satisfy the B average for the degree. No student who receives a grade of less than B in three or more courses will be permitted to continue in the program. A student who has accumulated two grades of C from the same faculty member may not register for a third course with this faculty member. A student who receives a grade of F in a course must make up this course in accordance with the recommendation of the adviser. A student who receives a grade of F in two courses will not be permitted to continue in the program.

Residency

In addition to course requirements, each student is expected to complete three quarters of full-time study in residence. Two of these quarters must be consecutive (one of which may be in the summer quarter); the third may occur at any time in the program or may be fulfilled through a full-time internship.

Qualifying Examination

A qualifying examination must be taken by each doctoral student seeking degree candidacy. The purpose of the examination is to evaluate the

student's general understanding of the field of specialization. The qualifying examination must be taken before the completion of forty-eight quarter hours of doctoral study.

Comprehensive Examination

After completion of all formal course work, the doctoral degree candidate must satisfactorily demonstrate, by means of a comprehensive examination, breadth and depth of knowledge in the area of specialization, as well as general professional understanding and comprehension of major issues in related fields.

Dissertation

As part of the degree program, each candidate must complete a dissertation which embodies the results of extended, creative, independent research and proper evaluation and interpretation of the results. A Dissertation Committee, made up of a major adviser and at least two other faculty members, must approve the dissertation.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the doctoral degree. The examination will be held at least three weeks before the Commencement at which the degree is to be awarded and the results of the examination will be made available immediately to the student.

The substance of the final oral examination will include the subject matter of the doctoral dissertation and significant developments in the area of the student's specialization.

Transfer Credit

In satisfying the course requirements beyond those required for the master's degree, the adviser may recommend to the Committee of the Graduate School of Education transfer credit up to a maximum of twenty-five percent of such course requirements. Students will be informed in writing when transfer credit has been officially awarded.

Time Limitation

After admission to degree candidacy, a maximum of five years will be allowed for completion of the degree requirements. Any extension of this time must be approved by the Committee of the Graduate School of Education.

Financial Aid

A limited amount of financial aid is available. Inquiries regarding this matter should accompany application.

fields of study

PROGRAMS IN PROFESSIONAL SPECIALIZATIONS

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Special Education Community Personnel	59
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All students must complete one of the programs as outlined. In most cases, the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the major adviser and approval of the Director of the Graduate School of Education.

*Teaching certification not mandatory.

MASTER OF EDUCATION CORE REQUIREMENT

Required of all candidates:

Area I — Research

50.815 Research Design in Education

Entrance into this course must be preceded by satisfactory completion of a proficiency examination in statistics administered by the Learning Resource Center (406 Dodge) or by satisfactory completion of 50.841 Introduction to Educational Statistics. *Important:* 50.815 must be included among the first six courses taken by each student. (See further information under the 50.815 course description.)

All candidates must complete at least one course in each of two of the following areas:

Area II — Psychological Foundations

50.803 Child Psychology

50.804 Adolescent Psychology

These two courses are intended for students with no previous background in psychology.

50.806 Psychology of Learning

50.810 Psychology of Personality

50.811 Psychology of Thinking

It is strongly recommended that entrance into any of these courses be preceded by a course in psychology.

50.808 Seminar in Child Development

Entrance into this course *must* be preceded by a course in child psychology or human development.

50.809 Seminar in Adolescent Development

Entrance into this course *must* be preceded by a course in adolescent psychology or human development.

50.850 Communications Theory

Area III — Social Foundations

50.801 Educational Anthropology

50.802 Sociology of Education

These two courses are intended for students with no previous background in sociology and anthropology.

50.805 Personality and Social Structure

It is strongly recommended that entrance into this course be preceded by a course in sociology, cultural anthropology, or social psychology.

50.820 Seminar in Contemporary Issues in American Education

Area IV — Humanistic Foundations

50.812 History of Education

50.818 Comparative Education

50.822 Topics in the Philosophy of Education

50.823 Education and Equality

PROGRAMS

Counselor Education

General Information

The Department of Counselor Education offers several concentrations within two major program clusters: School and College Counseling and Community and Rehabilitation Counseling. Each of the concentrations in these clusters is described on the following pages. Prospective students should apply to one of the two clusters.

The master's degree requirements may be completed by full-time students in four quarters or one calendar year. However, the Department considers these programs to be minimal and urges most students to take an additional year of study leading to the CAGS.

The practicum sequence (53.805-53.806) including the concurrently required counseling course (53.804) is offered only on a sequential basis beginning in the fall quarter. Part-time students may not begin this sequence until their second year of study. They must apply for practicum placement by April 1 of the spring preceding practicum placement.

Full-time students (eligible for practicum) will be asked to complete a practicum application either at the time of their group interview or immediately upon acceptance. In general, students should expect to spend two days (or twelve hours) weekly at their practicum sites between October 1 and June 15. Placements are made by matching student interests and experience with practicum site availability. Field site supervisors have the option of accepting or rejecting recommended students for placement in their setting. Arrangements for practicum site placement will be completed, in general, by August 1.

Some students, with special permission, may be able to use their place of employment as a practicum site, provided arrangements for supplementary experience are made with their advisers.

Candidates for admission to summer and fall quarters should complete application materials no later than the preceding April 15. After the application materials are submitted, applicants will be notified by mail of dates for small group interviews with other candidates and college staff. Acceptance decisions for both part-time and full-time applicants will be mailed between April 1 and May 31.

Core Curriculum Requirements

In addition to three Foundations of Education core requirements described on page 35, all program choices in the Department have a common core of required courses as follows:

- 53.800 Philosophical Foundations of Guidance and Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory and Process
- 53.805-53.806 Counseling Practicum

One of the following:

- 53.813 School Counseling Strategies
- 53.814 Vocational Counseling Strategies
- 53.815 Rehabilitation Counseling Strategies
- 53.816 Psychological Counseling Strategies

The Counseling Practicum is always specific to the particular concentration to which the student has been admitted. These core requirements constitute nine of the twelve courses required for the master's degree. The remaining three courses will be selected in consultation with the adviser. These course selections must be approved by the adviser prior to registration.

School and College Counseling Programs

Program concentrations in this cluster focus on elementary school counseling, secondary school counseling, career education, college counseling, student personnel, and cooperative education.

Elementary Counseling Program

The Elementary School Counseling Program stresses how to: 1) help children to grow in self-understanding and in positive fuller use of potential; 2) help parents to understand the developmental needs of all pupils and work with parents to meet the individual needs of their own children in the school situation; 3) participate in creating a school environment conducive to learning and growth for all children; and 4) participate in curriculum development and change. The training emphasizes individual counseling, group counseling, consulting, testing, and parent counseling in schools and related settings.

Elementary Counseling Practicum placements are made in a variety of urban and suburban elementary schools.

Any student who is considering applying to the CAGS program in School Psychology should confer with the coordinator of that program before planning the master's degree program.

Sample Program for Elementary Counseling Program:

Departmental Requirements

- 53.800 Philosophical Foundations of Guidance & Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory and Process
- 53.805-53.806 (01) Practicum in Elementary Counseling I, II

Specialized Courses

- 53.810 Elementary School Guidance
- 53.813 School Counseling Strategies
- 53.824 Individual Intelligence Testing

38 / FIELDS OF STUDY

Required Foundations Core Course

Area I 50.815 Research Design in Education

Recommended Foundations Core Courses

Area II 50.806 Psychology of Learning or

50.810 Psychology of Personality or

50.808 Seminar in Child Development

50.807 Abnormal Psychology

Area III 50.802 Sociology of Education or

50.805 Personality and Social Structure or

50.820 Seminar in Contemporary Issues in American
Education

Electives (Choose one)

53.808 Group Counseling or

53.811 Family and Parent Counseling or

56.807 Learning Disabilities

Secondary Counseling Program

The Secondary School Counseling Program assumes that there are things which the school counselor can do to make the school a better place in which to learn and to teach. Various ways in which the guidance person can work with pupils, parents, teachers, administrators, and community agencies as a counselor, as a consultant, and as a coordinator are emphasized. The focus of the program is on the practical background knowledge and the specific skills the counselor needs for helping students to learn more effectively, to make decisions more maturely, and to achieve personal fulfillment more completely.

Secondary Counseling practicum placements are made in a variety of urban and suburban secondary schools and school outreach programs.

Any student who is considering applying to the CAGS program in School Psychology should confer with the coordinator of that program before planning the master's degree program.

Sample Program for Secondary Counseling Program:

Departmental Requirements

53.800 Philosophical Foundations of Guidance &
Human Services

53.801 Tests and Test Procedures

53.804 Counseling Theory and Process

53.805-53.806 (02) Practicum in Secondary Counseling I, II

Specialized Courses

53.802 Vocational Development and Occupational Information

53.813 School Counseling Strategies

Required Foundations Core Courses

Area I 50.815 Research Design in Education

Recommended Foundations Core Courses

- | | | |
|----------|--------|--|
| Area II | 50.804 | Adolescent Psychology or |
| | 50.809 | Seminar in Adolescent Development |
| | 50.810 | Psychology of Personality or |
| | 50.807 | Abnormal Psychology |
| Area III | 50.802 | Sociology of Education or |
| | 50.805 | Personality and Social Structure or |
| | 50.820 | Seminar in Contemporary Issues in American Education |

Electives (Choose two)

- | | |
|--------|----------------------------------|
| 53.808 | Group Counseling |
| 53.811 | Family and Parent Counseling |
| 53.814 | Vocational Counseling Strategies |
| 56.807 | Learning Disabilities |

Career Education Program

The Career Education Program focuses on a variety of counselor-type roles within the career education orientation. These newly emerging roles within the broad field of career education encompass three specific dimensions of training: 1) the organization and utilization of career information as a resource; 2) the development of job placement—job-counseling skills; and 3) the innovation of appropriate curriculum practices and revisions. The program is designed so that at the practicum phase of their training, students can be placed in field settings where they can obtain actual experience in these dimensions of career education. This program is intended for students who have experience and/or an interest in working with school-age youth — grades kindergarten to twelve — in the area of career development and work placement.

Career Education Specialist Practicum placements are made in both comprehensive and vocational-technical schools where there is an emphasis on career education and/or work-study type programs.

Sample Program for Career Education Specialist:

Departmental Requirements

- | | |
|--------------------|--|
| 53.800 | Philosophical Foundations of Guidance & Human Services |
| 53.801 | Tests and Test Procedures |
| 53.804 | Counseling Theory and Process |
| 53.805-53.806 (03) | Career Education Practicum I, II |

Specialized Courses

- | | |
|--------|---|
| 53.802 | Vocational Development and Occupational Information |
| 53.814 | Vocational Counseling Strategies |
| 53.816 | Seminar in Career Education |

Required Foundations Core Course

- | | | |
|--------|--------|------------------------------|
| Area I | 50.815 | Research Design in Education |
|--------|--------|------------------------------|

Recommended Foundations Core Courses

Area II	50.806	Psychology of Learning or
	50.810	Psychology of Personality or
	50.809	Seminar in Adolescent Development
Area III	50.802	Sociology of Education or
	50.805	Personality and Social Structure or
	50.820	Seminar in Contemporary Issues in American Education

Electives (Choose one)

53.807	Administration of Guidance Services
53.808	Group Counseling
53.813	School Counseling Strategies

College Counseling and Student Personnel Services Program

The study of both college counseling and student personnel positions is similar and is based on the assumption that the student personnel worker must have the human relations skills of the counselor, and the counselor must have an understanding of both the learning development needs of students and the instructional environment of the college setting. Students should work to develop a basic knowledge of vocational development and career planning, information gathering, interviewing techniques, decision-making strategies, and group process. Students should also start to emphasize a counseling role in a counseling center or a student personnel role, which is more programmatic, within an institution. Practicum placements often may be varied to suit individual interests. Some positions examined in the program of study include counseling in junior colleges or residence halls; counseling in financial aid, student activities, or admissions offices; or that of assistant to a dean of students.

College Counseling and Student Personnel Practicum placements are made in a variety of junior college, college, and university settings in the Greater Boston area. In addition to counseling center placements, there may be placements in residence halls, financial aid offices, and other student personnel program offices. Placements are also made in such higher education-related settings as the Center for Alternative Education, a personal development program.

Sample Program for College Counseling Program:

Departmental Requirement

53.800	Philosophical Foundations of Guidance & Human Services
53.801	Tests and Test Procedures
53.804	Counseling Theory & Process
53.805-53.806 (04)	College Counseling Practicum I, II

Specialized Courses

- 53.809 The College Student and the Campus
- 53.814 Vocational Counseling Strategies or
- 53.816 Psychological Counseling Strategies

Required Foundations Core Course

- Area I 50.815 Research Design in Education

Recommended Foundations Core Courses

- Area II 50.810 Psychology of Personality or
- 50.809 Seminar in Adolescent Development
- 50.807 Abnormal Psychology
- Area III 50.805 Personality and Social Structure or
- 50.820 Seminar in Contemporary Issues in American Education

Electives (Choose two)

- 53.814 Vocational Counseling Strategies or
- 53.816 Psychological Counseling Strategies
- 53.808 Group Counseling

Sample Program for Student Personnel Services Program:

Departmental Requirements

- 53.800 Philosophical Foundations of Guidance & Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory & Process
- 53.805-53.806 (055) Student Personnel Practicum I, II

Specialized Courses

- 53.809 The College Student and the Campus
- 53.814 Vocational Counseling Strategies
- 53.812 Seminar in Student Personnel Work

Required Foundations Core Course

- Area I 50.815 Research Design in Education

Recommended Foundations Core Courses

- Area II 50.810 Psychology of Personality or
- 50.809 Seminar in Adolescent Development
- 50.807 Abnormal Psychology
- Area III 50.805 Personality and Social Structure or
- 50.820 Seminar in Contemporary Issues in American Education

Electives (Choose one)

- 52.864 Typologies of Higher Education
- 52.868 The Community College

Cooperative Education Program

The rapid expansion of cooperative education programs in higher education throughout the United States has increased the need for persons to staff the centers that coordinate and operate these programs. Northeastern University is the largest cooperative education institution in the world, and as such, may provide an excellent study opportunity for the student interested in this aspect of higher education. At the master's level, study emphasizes a counseling base because the coordinator's prime role involves student contact. The three major elements in the coordinator's role are: 1) vocational decision-making counseling; 2) work placement and work evaluation; and 3) curriculum development within the institution. The coordination function involves providing links between students and their educational program, and the employer and their work setting.

Cooperative Education Coordinator placements are decided in the Division of Cooperative Education, Northeastern University, and in other colleges and junior colleges in the area that have or are developing cooperative education programs.

Sample Program for Cooperative Education Specialist:

Departmental Requirements

- 53.800 Philosophical Foundations of Guidance & Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory & Process
- 53.805-53.806 (06) Cooperative Education Practicum I, II

Specialized Courses

- 53.802 Vocational Development and Occupational Information
- 53.809 The College Student and the Campus
- 53.814 Vocational Counseling Strategies
- 52.824 Administration of Cooperative Education

Required Foundations Core Course

- Area I 50.815 Research Design in Education

Recommended Foundations Core Courses

- Area II 50.806 Psychology of Learning or
- 50.809 Seminar in Adolescent Development or
- 50.810 Psychology of Personality
- Area III 50.802 Sociology of Education or
- 50.805 Personality and Social Structure or
- 50.820 Seminar in Contemporary Issues in American Education

Electives (Choose one)

- 53.808 Group Counseling
- 53.816 Psychological Counseling Strategies

Community Mental Health, Community Services, Rehabilitation Counseling Programs

This cluster provides study in three programmatic areas: Community Services Counseling (preventive mental health), Rehabilitation Counseling, and Community Mental Health Counseling. These programs emphasize three aspects of professional development: field-based training, didactic learning and personal growth. Field-based training is examined in extensive practicum work in clinics and agencies in the metropolitan Boston area; didactic learning is offered in graduate courses and practicum supervision on campus and in the field. Personal growth is encouraged through consultation with program advisers, field supervisors and in group counseling courses.

Community Services Program

The Community Services Counseling Program is designed for students interested in a variety of human services agencies providing preventive mental health, informational, supportive and recreational services for broad segments of the population regarded as normally behaving. Much of the work could be categorized as preventive community health. Students are given the opportunity to develop a basic knowledge of vocational development and career planning, information gathering, interviewing techniques and decision-making strategies. In addition, psychometrics, adolescent and adult personality development, procedures in educational and vocational placement, and the utilization of multiple-helping agencies in meeting clients' needs are examined. They may acquire skills in individual and small group counseling and decision-making procedures.

Community Services Counseling practicum sites include state offices of the Division of Employment Security, Manpower Training Programs, Model Cities Programs, YMCA, YWCA, Boys' Clubs, Girls' Clubs, recreational facilities, community centers, drop-in centers, Youth Activities Commission, and career planning agencies.

Sample Program for Community Services Counseling Program:

Departmental Requirements:

- 53.800 Philosophical Foundations of Guidance & Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory and Process
- 53.805-53.806 (07) Community Services Practicum I, II

Specialized Courses:

- 53.814 Vocational Counseling Strategies
- 53.808 Group Counseling

Required Foundations Core Course:

- Area I 50.815 Research Design in Education

Recommended Foundations Core Courses

- | | | |
|----------|--------|--------------------------------------|
| Area II | 50.810 | Psychology of Personality or |
| | 50.809 | Seminar in Adolescent Development or |
| | 50.807 | Abnormal Psychology |
| Area III | 50.805 | Personality and Social Structure |

Electives (Choose two):

- | | |
|--------|---|
| 53.802 | Vocational Development and Occupational Information |
| 52.816 | Seminar in Career Education |
| 53.816 | Psychological Counseling Strategies |
| 56.956 | Community Planning in Rehabilitation |

Rehabilitation Counseling Program

The Rehabilitation Counseling program is designed for students interested in the delivery of comprehensive services to disabled and handicapped populations with the ultimate objective of improving the nature of their vocational, social, family, and personal functioning. The focal population includes the physically disabled, mentally ill, mentally retarded, alcohol and drug addicted, chronically dependent, and penal offenders. Special emphasis is placed on the severely disabled client. Students are given the opportunity to study the nature of physical, mental, and social handicaps; existing rehabilitative services through work experiences, field visits, reading and discussions with agency personnel; elements of rehabilitation operations, including systematic evaluation, individual counseling, planning for additional needed examinations and services, planning for training, vocational planning and placement, and follow-up services in the community.

Rehabilitation counseling practicum placements may be made in community workshops for the physically handicapped, mentally ill, mentally retarded; workshops and halfway houses for drug addicts, alcoholics, and penal offenders; rehabilitation centers in mental hospitals, schools for mentally retarded and correctional institutions; rehabilitation programs for dependent persons in the welfare system and in the Massachusetts Rehabilitation Commission. A limited number of stipends may be available to qualified candidates.

Sample Program for Rehabilitation Counseling Program:

Departmental Requirements

- | | |
|--------------------|---|
| 53.801 | Tests and Test Procedures |
| 53.804 | Counseling Theory and Process |
| 53.805-53.806 (08) | Rehabilitation Counseling Practicum I, II |

Specialized Courses

- | | |
|--------|--------------------------------------|
| 53.815 | Rehabilitation Counseling Strategies |
| 56.950 | Introduction to Rehabilitation |
| 56.951 | Medical Rehabilitation |
| 56.980 | Psychological Problems of Disability |
| 56.965 | Occupational Placement |

Required Foundations Course

50.815 Research Design in Education

Recommended Foundations Core Courses

Area II 50.810 Psychology of Personality or

50.807 Abnormal Psychology

Area III 50.805 Personality and Social Structure

Electives (Choose three)

53.808 Group Counseling

53.811 Family and Parent Counseling

56.839 The Severely Handicapped

56.984 Rehabilitation of the Penal Offender

Community Mental Health Counseling

The Community Mental Health Counseling program is designed for students interested in the delivery of comprehensive mental health services to individuals, families and groups experiencing personal, developmental and social problems. Students have the opportunity to study major approaches to individual, group, marriage and family counseling. They may examine important environmental effects on the behavior of various client populations. Because of the comprehensive nature of the community mental health field, students seeking admission to this program should give serious consideration to a two-year commitment or its equivalent leading to the completion of both an M.Ed. degree and a Certificate of Advanced Graduate Study.

Community Mental Health Counseling practicum placements are made in out-patient clinics, in-patient facilities, community mental health centers, city hospitals having family counseling services, state mental hospitals, drop-in centers, career planning agencies, adolescent counseling programs, street work and outreach counseling programs.

Sample Program for Community Mental Health Counseling Program:

Departmental Requirements

53.800 Philosophical Foundations of Guidance &
Human Services

53.801 Tests and Test Procedures

53.804 Counseling Theory and Process

53.805-53.806 (09) Community Mental Health Practicum I, II

Specialized Courses

53.816 Psychological Counseling Strategies

53.808 Group Counseling

53.811 Family & Parent Counseling

53.831 Advanced Group Counseling

Required Foundations Core Course

Area I 50.815 Research Design in Education

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Recommended Foundations Core Courses

Area II	50.807	Abnormal Psychology or
	50.808	Seminar in Child Development or
	50.809	Seminar in Adolescent Development
Area III	50.805	Personality and Social Structure

Electives (Choose one)

56.956	Community Planning in Rehabilitation
53.818	Case Studies in Marriage and Family Counseling
53.830	Seminar in Contemporary Issues in Counseling

Curriculum and Instruction (Including Programs in Reading)

The programs in Curriculum and Instruction are appropriate for certified or experienced teachers who wish to study instructional leadership and curriculum development, who wish to have the opportunity to expand their professional backgrounds in subject matter or pedagogy, or who wish to work toward reading certification.

This program can afford the student a setting in which:

- (1) the educational process is viewed as an ongoing activity embodying both continuity in each of its parts and interrelatedness among its parts;
- (2) learning activities, which promote continuity and interrelatedness, are planned and instituted;
- (3) appropriately existing programs and practices in their special fields are evaluated and modified;
- (4) educational needs are identified and analyzed, and suitable plans are developed to meet them;
- (5) desired changes in educational practice are instituted.

The following roles are stressed in this program:

- (1) specialist in a particular content area, such as reading, mathematics, science, social studies, English-language arts, at one or more levels — elementary, secondary, or adult education;
- (2) curriculum specialist in a variety of educational settings;
- (3) instructional specialist such as team leader, conductor of workshops, master teacher, and so forth, in a school or other educational setting.

The Master of Education in Curriculum and Instruction is divided into four basic areas of study:

1. Master of Education Core
2. Curriculum and Instruction Core

The Curriculum and Instruction Core consists of two sequential courses which individually and together emphasize a unitary view of the processes of curriculum development and instructional practices at all levels of education and in all school subjects.

3. Specialization

A specialization consists of a number of courses constructed around a broad area through which students can pursue their specific interests while at the same time keeping sight of larger contexts.

Students will normally select one area of specialization from those listed, depending upon their background and interests. Students whose interests lie outside these areas may be permitted to design, with their advisers, a program to meet their needs.

4. Electives

The elective portion of the Curriculum and Instruction Program enables students to pursue other areas of interest which complement or extend their area of specialization. Electives can be selected broadly from the offerings of the Graduate Schools of the University.

Specimen Programs

Master of Education Core

Three courses as defined on page 35.

Curriculum and Instruction Core*

51.880 Evolution and Revolution in the School Curriculum

51.881 Seminar in Curriculum: Alternative Designs (51.881 is not a required course for students specializing in Reading.)

*Students who have completed 51.801 may be excused from 51.880 or 51.881 with the approval of the office of the Director of the Graduate School of Education.

Specializations

Science-Mathematics

51.837 Curriculum Problems in Science and Mathematics

51.838 Seminar in Science and Mathematics Teaching

51.839 Implementing Change in Science and Mathematics Education
Electives (four to be approved by adviser)

or

Social Studies

51.851 Seminar in Current Issues in the Social Studies

51.853 History and the Social Sciences in the School Curriculum

51.854 Social Science Materials Seminar
Electives (four to be approved by adviser)

or

English-Language Arts

51.842 The English-Language Arts Curriculum

Two courses in Curriculum and Instruction appropriate to major

Electives (four to be approved by adviser)

or

Reading

- 51.870 Foundations of Reading
- 51.871 Reading and Language Disabilities I
- 51.872 Literature and Materials Seminar
- 51.873 Reading Clinic I
- 51.875 Reading Clinic II
- Electives (three, at least one of which must be a Reading course, to be approved by adviser)

or

Instructional Technology

A set of courses carefully selected through consultation with the adviser.

or

General Academic

- 51.870 Foundations of Reading
- 51.871 Reading and Language Disabilities I
- 51.837 Curriculum Problems in Science and Mathematics Education
- 51.838 Seminar in Science and Mathematics Teaching
- 51.853 History and the Social Sciences in the School Curriculum
- 51.854 Social Science Materials Seminar
- Elective (one to be approved by adviser)

or

Combined Reading Certification

A special program offering the Liberal Arts or non-Education graduate the opportunity to earn the Master of Education degree plus work toward teacher certification (elementary or secondary) and certification as a reading specialist (K-12). This program is for full-time students only and will take a minimum of five full-time quarters to complete. Students will be accepted to begin in the summer or fall quarters. (See page 63 for description of the teacher certification dimensions of this program.)

or

Other Purposes

Students who wish to specialize in curriculum and instruction in a field not included in those listed above should make an appointment with an adviser for this program who will help them develop an appropriate course of study by drawing on courses offered throughout the Graduate Schools of the University.

Each candidate's program must be approved by their faculty adviser before beginning a course of study. Students admitted to special student status who feel they may eventually wish to be admitted to degree candidacy must consult with an appropriate faculty adviser before enrolling in any course.

Early Childhood Education

In the field of Early Childhood Education two distinct programs are provided at the master's degree level. The programs are in the areas of Administration of Early Childhood Education and Teaching in Early Childhood Education.

Administration of Early Childhood Education

This program is designed for the student interested in the field of Administration of Early Childhood Education, which includes such positions as administrator or director of day-care centers, nursery schools, kindergartens, and similar organizations. Study explores effective administrative behavior related to Early Childhood Education based upon knowledge of children, learning, and the administrative process. A typical program is as follows:

Master of Education Core (required of all candidates)

50.815 Research Design in Education

50.808 Seminar in Child Development

One additional course from Area III (Social Foundations) or Area IV (Humanistic Foundations)

Educational Administration Requirements

52.810 Leadership in Education: Part I

52.811 Leadership in Education: Part II

52.813 Instructional Leadership: Curriculum Development and Supervision

52.826 Administration of the Elementary School

52.843 Administrative Internship

52.828 Administration of Early Childhood Education

53.811 Family and Parent Counseling

or

56.835 Socio- and Psychodynamics of Family Life

Electives

Two courses chosen in consultation with an adviser

Teaching in Early Childhood Education

This program is designed for certified elementary teachers interested in an instructional or a related role in the field of Early Childhood Education such as teacher, coordinator, or supervisor in day-care centers, nursery schools, kindergartens, and similar organizations. Study explores instructional behavior related to Early Childhood Education based upon knowledge of children, teaching and learning. A typical program is as follows:

Master of Education Core (required of all candidates)

50.815 Research Design in Education

50.808 Seminar in Child Development

One additional course from Area III (Social Foundations) or Area IV (Humanistic Foundations)

Early Childhood Program Requirements

- 51.880 Evolution and Revolution in the School Curriculum
- 51.881 Dynamics of Curriculum Design
- 56.848 Early Childhood Learning Problems—Identification and Program Development
- 93.801 Seminar in Early Childhood Education Theory and Practice
- 93.802 Practicum in Early Childhood Education I
- 93.803 Practicum in Early Childhood Education II
- 53.811 Family and Parent Counseling
- or
- 56.835 Socio- and Psychodynamics of Family Life

Elective

One course chosen in consultation with an adviser

For course descriptions see appropriate departmental offerings as well as interdepartmental courses.

Educational Administration

In the field of educational administration, three distinct programs are provided at the master's degree level. These programs are in the areas of elementary and secondary school administration, occupational and career education, and international experiential/work-related education.

School Administration

This program is designed for the student interested in the field of educational administration. Emphasis in study is given to beginning positions such as assistant principal, principal of a small school, department chairman, special program director, or beginning administrator in allied fields. A typical program is as follows:

Master of Education Core (required of all candidates)

Three courses as defined on page 35.

Educational Administration Requirements

- 52.810 Leadership in Education: Part I
- 52.811 Leadership in Education: Part II
- 52.813 Instructional Leadership: Curriculum Development and Supervision

Departmental Program of Study

- 52.805 Simulated Problems: Secondary School Administration
- or
- 52.814 Simulated Problems: Elementary School Administration
- 52.806 Directed Field Experiences in the Administration of the Elementary School
- 52.807 Directed Field Experiences in the Administration of the Secondary School
- 52.808 Seminar in Educational Administration

52.826 Administration of the Elementary School
or

52.827 Administration of the Secondary School
Electives (to be approved by adviser)

Satisfactory completion of an oral conference and a written final comprehensive examination are also degree requirements of this program.

Occupational and Career Education Administration

This program of study is designed to help prospective administrators and supervisors of occupational and career education develop understanding, skills, and technical competencies necessary when assuming and performing leadership functions in such positions as coordinators, supervisors, or district-wide directors in elementary schools, regular or comprehensive secondary schools, specialized vocational schools, community colleges, or at the state level. Satisfactory completion of an oral conference and a written comprehensive examination are also degree requirements of this program.

Master of Education Core (required of all candidates)

Three courses as outlined on page 35.

Educational Administration Requirements (4)

52.810 Leadership in Education Part I

52.811 Leadership in Education Part II

52.813 Instructional Leadership: Curriculum Development and Supervision

52.826 Administration of the Elementary School
or

52.827 Administration of the Secondary School

Departmental Program of Studies in Occupational Education (5)

52.806 Directed Field Experiences in the Administration of the Elementary School

52.807 Directed Field Experiences in the Administration of the Secondary School

52.815 Simulated Problems: Administration of Occupational and Career Education

52.816 Seminar in Occupational and Career Education

52.843 Internship—other appropriate occupational electives from the Graduate School of Education

International Experiential/Work-Related Education

The purpose of this graduate program is to introduce students to the broad field of experiential/work-related education and offer them information that should be helpful in planning, organizing, and administering work-related education programs in their own countries. Two types of target populations are addressed: 1) American students who are interested in working abroad or who wish to add an international dimension to their programs, and 2) foreign nationals who will be involved in planning and implementing such programs at home.

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A typical program is as follows:

Master of Education Core (required of all candidates)

Three courses as defined on page 35.

Required Courses

50.851 Cross-cultural Perspectives on Work

51.911 International Perspectives on Teaching and Learning

51.912 International Perspectives on Curriculum Planning and Development

52.843 Internship I and II

52.871 Typologies of Experiential Education

52.872 Administration of Experiential Education Programs

Electives

A minimum of two courses which will be appropriate to major, selected in consultation with the program adviser.

Educational Research

This program is designed to help develop educational researchers who have: 1) an understanding of the nature and characteristics of research as it is carried on in educational research agencies; 2) a basic knowledge of research methodology and related theory that enables them to assist at all stages of educational research; and 3) the technical skill to carry out independently the operational aspect of educational research.

This program may be taken on a full- or part-time basis, and study may begin in any quarter. A full-time student will normally complete degree requirements in one academic or calendar year (three or four quarters). The culminating component of the program is the planning, executing, and writing up of research for a thesis, intended as a small-scale but usually original investigation into an educational problem. The thesis may be presented in one of several formats selected jointly by the student and the adviser.

All candidates will be required to complete the following program:

Master of Education Core (required of all candidates)

50.815 Research Design in Education (Area I)

Two courses from the remaining areas as described on page 35.

Educational Research Requirements

50.841 Introduction to Educational Statistics

50.842 Intermediate Educational Statistics

50.817 Advanced Research Design in Education

50.847 Introduction to Computer Programming: FORTRAN IV

50.891 Thesis (equivalent to two courses)

or

50.845-846 Independent Research Seminars I & II

Electives (three)

Human Development

The overall objective of this program is to provide opportunities for practicing and prospective educators to expand and deepen their knowledge and understanding of human development in its psychological and social aspects. Completion of the program does not lead to fulfillment of any type of state certification, and a teaching certificate is not required for admission to the program. However, the program can provide a useful background for persons teaching, or planning to teach, psychology and behavioral science in secondary and elementary schools. Full-time students may take a maximum of four courses per term and may complete the program in a minimum of three quarters. Part-time students may take a maximum of two courses per term and may complete the program in a minimum of six quarters.

Candidates may begin study in any quarter and will be required to complete the following program:

Master of Education Core (required of all candidates)

50.815 Research Design in Education

Two additional courses, one from Area III (Social Foundations) and one from Area IV (Humanistic Foundations).

Human Development Requirements

50.806 Psychology of Learning

or

50.811 Psychology of Thinking

50.810 Psychology of Personality

or

50.805 Personality and Social Structure (if not taken in Ed.M. Core, above)

50.808 Seminar in Child Development

50.809 Seminar in Adolescent Development

50.819 Theories of Developmental Psychology

Electives (choice of courses or thesis):

Courses: four courses, chosen in consultation with an adviser, from those offered in the Graduate School of Education and other departments in the University

Thesis: 50.817 Advanced Research Design in Education

50.842 Intermediate Educational Statistics

50.891 Thesis (equivalent to two courses)

Rehabilitation Administration and Special Education

Rehabilitation Administration

This program is designed for students interested in administrative leadership and research in a wide range of rehabilitation and health-care service agencies.

Students majoring in Rehabilitation Administration should anticipate taking 15 credit courses for the degree.

The program ordinarily takes a minimum of one calendar year for full-time students. During this time the students will select academic course work, 500 hours of practical field work experience, and a full-time internship experience.

Recommended Core Courses

- 50.805 Personality and Social Structure
- 50.807 Abnormal Psychology

Department Requirements

- 56.950 Introduction to Rehabilitation
- 56.951 Principles of Medical Rehabilitation
- 56.952 Rehabilitation and Social Services
- 56.953 Organization and Administrative Theory
- 56.961 Fiscal Management I
- 56.963 Fiscal Management II
- 56.832 Group Dynamics
- 56.960 Practicum in Rehabilitation Administration
- 56.956 Community Planning in Rehabilitation

Electives chosen from

- 56.957 Federal-State Relations in Rehabilitation
- 56.958 Social Welfare and Rehabilitation
- 56.959 Rehabilitation Research
- 56.962 Administration of a Sheltered Workshop
- 56.964 Legal Aspects of Rehabilitation and Special Education
- 56.965 Occupational Placement
- 52.865 Systems Theory in Education
- 53.815 Rehabilitation Counseling Strategies

Special Education

Of the five programs in Special Education, three are designed for teachers of children, youth, and adults having mild, moderate, or severe special needs. The fourth program focuses on early childhood handicaps. The fifth, Special Education Community Personnel (SECP), is for those planning to work outside the classroom in schools, hospitals, and/or public or private agencies.

Students should apply by April 1 for admission to either the summer or fall quarters. A statement of career goals must be included with the admissions materials.

In all but the SECP and Severely Handicapped programs, eligibility for Massachusetts teacher certification is a prerequisite for graduation from Special Education programs. Students without certification may apply concurrently for the Northeastern University Nondegree Program for preparation toward Certification of Elementary and Secondary Teachers and a Special Education program. Regular student teaching must be successfully completed before Special Education student teaching is done.

In order to obtain Massachusetts Letters of Approval in Special Needs, degree candidates must have course work in child psychology or development and learning theory. If course work in these areas has not previously been completed, these courses must be taken before graduation from a Special Education Master's Degree Program.

Applicants with secondary-level certification may need to obtain additional background in reading and mathematics teaching methods and materials at the elementary level.

Students must meet with their advisers before registering for courses. A program of courses and field experiences will be developed in consultation with the major adviser based on the student's background, experience, and interests. It will include basic requirements of the graduate school, the department, and the State Department of Education. Electives will be drawn from other programs as warranted. To complete a Master's Degree Program in Special Education, the candidate must demonstrate specified competencies to the faculty in course work, field experiences, and a comprehensive examination. The comprehensive examination will be taken after the student has completed at least nine courses in the Special Education Program.

A program leading to approval in a single area of the SECP program will normally require four to five quarters of full-time graduate study. A student who requires supplementary course work for approval and/or certification should expect to spend additional time completing the program.

Department Core Curriculum Requirements

In addition to the Foundations of Education core requirements described on page 35 and the prerequisites described above, the programs in the Division of Special Education have the following common core of required courses:

- 55.806 Language Disturbances in Children (not required for SECP candidates)
- 56.807 Educating Individuals with Learning Disorders
- 56.840 Psychology of Individuals with Special Needs
- 56.846-56.847 Special Needs: Diagnostic-Prescriptive Teaching I & II (not required for SECP candidates)
- 56.880-56.881 Etiology and Development of Deviations in Special Needs Individuals

Field Work and Seminar

Student Teaching and Seminar

SECP Practicum and Seminar

A department core curriculum requirement may be waived if, in the opinion of the adviser, the student has had an equivalent course.

Field Work and Student Teaching or Practicum are specific to the student's major interest. Students who are certified or have a Letter of Approval from the Massachusetts State Department of Education as a Special Needs Teacher may not be required to student teach. Student teaching in another area of Special Needs or an appropriate elective course may be substituted with the written approval of the student's academic adviser.

Approval in writing of the academic adviser will be required before the student may do field work or student teaching. Written approval of the academic adviser will be required prior to obtaining a waiver of student teaching or field work.

Teacher Preparation Programs

Generic Special Educator

(Full Program Not Offered 1978-79)

This program focuses on the resource room and consultant teachers who deal with children having mild special needs.

Required Courses

50.815 Research Design in Education

Recommended Core Courses (Students must plan program with adviser before registering.)

50.805 Personality and Social Structure

50.806 Psychology of Learning

50.807 Abnormal Psychology

50.808 Seminar in Child Development

Department Core Curriculum Requirements

see page 55.

Required Courses for Generic Special Educator

56.801 Alternatives for Mainstreaming Individuals with Special Needs

56.831 Education of Individuals with Behavior Disorders

Further electives may be chosen in consultation with the student's academic adviser.

Field work and student teaching assignments concentrate on mild disabilities in resource room and diagnostic-prescriptive settings.

Moderate Special Needs

This area of specialization focuses on work with mildly to moderately handicapped pupils in a variety of educational and residential settings.

Required Core Course

50.815 Research Design in Education

Recommended Core Courses

- 50.805 Personality and Social Structure
- 50.806 Psychology of Learning
- 50.807 Abnormal Psychology
- or
- 50.808 Seminar in Child Development

Department Core Curriculum Requirements

See page 55.

Required Course for Moderate Special Needs

- 56.831 Educating Individuals with Behavior Disorders

Further electives may be chosen in consultation with the student's academic adviser.

Field work and student teaching assignments will concentrate on various educational and residential settings.

Severely Handicapped

Teachers of the severely handicapped may function as teachers in a variety of settings. Classes may be situated in private or public schools or institutions. It is recognized that the functions of the student will vary greatly, depending upon the setting and the requirements of children in any given situation. With this in mind, students will study in certain core areas and then be given more specialized study in working with the severely handicapped.

Required Core Course

- 50.815 Research Design in Education

Recommended Core Courses

- 50.805 Personality and Social Structure
- 50.806 Psychology of Learning
- 50.807 Abnormal Psychology
- or
- 50.808 Seminar in Child Development

Department Core Curriculum Requirements

See page 55.

Severely Handicapped Program

- 56.835 Socio- and Psychodynamics of Family Life
- 56.838 Development and Implementation of Programs for the Severely Handicapped
- 56.839 Severely Handicapped

Electives are chosen from

- 56.848 Early Childhood Learning Problems — Identification and Program Development
- 56.882 Seminar in Mental Retardation
- 55.803 Cerebral Palsy
- 55.804 Neuroanatomy
- 55.816 Test Procedures in Speech and Language Pathology
- 55.861 Neuropathology
- 62.842 Physical Education for Students with Special Needs
- 62.860 Early Childhood Motor Patterns
- 62.864 Perceptual Motor Development
- 62.884 Movement and the Learning Process

Early Childhood Handicapped

Teachers who complete this program may be given the opportunity to function in a variety of roles: (1) teacher in a self-contained handicapped early childhood classroom; (2) teacher of an integrated program; and (3) consultant to other teachers of young children.

Prerequisite

Certificate or eligibility for certification in Massachusetts to teach at the elementary level.

Prior training, preferably with experience in "regular" early childhood education. Students without this preparation may be admitted but will be required to take additional appropriate courses.

Required Core Course

- 50.815 Research Design in Education

Recommended Core Courses

- 50.805 Personality and Social Structure
- 50.806 Psychology of Learning
- 50.807 Abnormal Psychology

or

- 50.808 Seminar in Child Development

Department Core Curriculum Requirements

See page 55.

Required Courses

- 56.831 Educating Individuals with Behavior Disorders
- 56.848 Early Childhood Learning Problems—Identification and Program Development

Electives

- 56.835 Socio- and Psychodynamics of Family Life
- Others chosen in consultation with adviser

Special Education Community Personnel
(A Noncertification Program)

Northeastern University's Department of Rehabilitation and Special Education offers a program for those interested in nonteaching positions with handicapped individuals in hospitals, institutions, public agencies, or as liaison personnel working with community agencies and the school.

Before considering this program, the applicant should either have had previous experience or be currently employed in a nonteaching position working with the handicapped. If applicants do not have this experience, their career goals must be clearly formulated. Competencies necessary for the applicant's career goals, as well as each applicant's background of education and experience, will be considered in developing a program of appropriate course work and practicum experiences. Approximately four to five quarters of full-time graduate study are necessary to complete this program.

Required Core Course

50.815 Research Design in Education

Recommended Core Courses

50.805 Personality and Social Structure

50.806 Psychology of Learning

50.807 Abnormal Psychology

or

50.808 Seminar in Child Development

Department Core Curriculum Requirements

See page 55.

Electives chosen from

56.835 Socio- and Psychodynamics of Family Life

56.839 Severely Handicapped

56.845 Rehabilitation and the Special Education Teacher

56.952 Rehabilitation and Social Service

56.956 Community Planning in Rehabilitation

56.964 Legal Aspects of Rehabilitation and Special Education

51.920 Methods and Materials in Adult Literacy Education

Other courses in consultation with adviser.

Speech Pathology and Audiology

The program leading to the degree of Master of Education in either Speech Pathology or Audiology is designed to provide students with the opportunity to prepare for membership in and certification by the American Speech and Hearing Association.

This program assumes that students have completed an undergraduate, preprofessional degree program in speech and hearing. Such students may expect to devote a minimum of seven academic quarters to complete the academic and clinic requirements.

Students who do not have the proper academic and clinic background at the undergraduate level may expect to devote a minimum of nine academic quarters to complete the academic and clinic requirements.

Students presently working in the field who are interested in a part-time program, should consult the Chairperson of the Department for further information.

Applicants should specify a major in either Speech Pathology or Audiology.

This program is conducted with the cooperation of many community agencies and schools.

Speech Pathology

Each student's program is individually designed with the assistance of a faculty adviser to assure that course work is distributed in all major professional areas including: diagnostics, articulation, language, fluency, voice, and audiology. Students should seek advice about how the program may help to prepare them to apply for certification by the American Speech and Hearing Association.

Master of Education Core (required of all candidates)

Three courses as defined on page 35.

Speech Pathology Courses

Prerequisites for graduate study

- 55.122 Introduction to Speech and Hearing
- 55.123 Speech Science
- 55.125 Anatomy and Physiology of the Auditory Mechanism
- 55.126 Anatomy and Physiology of the Vocal Mechanism
- 55.131 Developmental Semantics and Syntax
- 55.133 Developmental Phonology
- 55.141 Phonemic Disorders
- 55.142 Introduction to Audiology
- 55.154 Fluency Disorders

Departmental requirements

- 55.816 Test Procedures in Speech and Language Pathology
- 55.812 Differential Diagnosis in Speech and Language Pathology
- 55.804 Neurological Bases of Communication
- 55.806 Language Disturbances in Children
- 55.805 Seminar: Voice Disorders
- 55.811 Clinical Management of Stuttering
- 55.813 Advanced Clinical Practice
- 55.860 Aphasia Rehabilitation
- 55.865 Seminar: Speech Science

Departmental electives

Students in Speech-Language Pathology may choose a minimum of one

elective from departmental offerings or from a supplemental area.

- 55.822 Seminar: Orofacial Anomalies
- 55.823 Psychosocial Aspects of Communication Disorders
- 55.824 Seminar: Speech and Language Pathology
- 55.861 Neuropathology
- 55.863 Advanced Study of Articulation Disorders
- 55.891 Thesis (optional)
- 55.899 Directed Study

Comprehensive Examination

Satisfactory completion of a comprehensive examination is a requirement for this program.

Audiology

Each student's program is individually designed with the assistance of a faculty adviser to assure that course work is distributed among evaluation, diagnosis, and aural rehabilitation. Students should seek advice about how the program may help to prepare them to apply for certification by the American Speech and Hearing Association.

Master of Education Core (required of all candidates)

Three courses defined on page 35.

Audiology Courses

Prerequisites for graduate study

- 55.122 Introduction to Speech and Hearing
- 55.123 Speech Science
- 55.125 Anatomy and Physiology of the Auditory Mechanism
- 55.126 Anatomy and Physiology of the Vocal Mechanism
- 55.131 Developmental Semantics and Syntax
- 55.133 Developmental Phonology
- 55.141 Phonemic Disorders
- 55.142 Introduction to Audiology
- 55.154 Fluency Disorders

Departmental requirements

- 55.804 Neurological Bases of Communication
- 55.813 Advanced Clinical Practice
- 55.814 Clinical Audiometry I
- 55.815 Clinical Audiology
- 55.818 Pathologies of the Ear
- 55.819 Clinical Audiometry II
- 55.821 Seminar: Audiology
- 55.828 Aural Rehabilitation
- 55.862 Psychoacoustics
- 55.866 Seminar: Hearing Science

Departmental electives

Students in Audiology may choose a minimum of one elective from

departmental offerings or from a supplemental area.

- 55.822 Seminar: Orofacial Anomalies
- 55.823 Psychosocial Aspects of Communication Disorders
- 55.824 Seminar: Speech and Language Pathology
- 55.861 Neuropathology
- 55.863 Advanced Study of Articulation Disorders
- 55.891 Thesis (optional)
- 55.899 Directed Study

Comprehensive Examination

Satisfactory completion of a comprehensive examination is a requirement for this program.

Education of the Hearing Impaired (Full Program Not Offered 1978-79)

The following curriculum, which focuses on teachers of the deaf, is offered in conjunction with cooperating schools. Because of affiliations with such schools, students may be required to take some courses off campus. Candidates lacking prerequisite courses will be required to complete them prior to the following program.

Graduate students entering the Deaf Education program without teacher certification must fulfill all requirements for the Nondegree Program for Certification of Elementary and Secondary Teachers (see pages 63-64) in addition to the Deaf Education graduate requirements. During the fall and winter quarters of the first year, such students will take two certification courses and two department courses, and during the spring quarter will take Student Teaching only.

Sample Program for Deaf Education:

- | | |
|--------|---|
| Qtr. 1 | 55.828 Aural Rehabilitation
55.814 Clinical Audiometry I
55.829 Foundations of Deaf Education |
| Qtr. 2 | 55.826 Teaching Reading to the Deaf
55.827 Methods & Materials in Deaf Ed.
55.867 Intermediate Sign Language |
| Qtr. 3 | 55.806 Language Disturbances in Children
55.869 Teaching Language to the Deaf
55.852 Student Teaching of the Hearing Impaired |
| Qtr. 4 | 55.825 Teaching Speech to the Deaf
56.807 Learning Disabilities |

Winter Quarter

- 51.801 Curricula of American Schools
- 51.864 Methods and Materials for Teaching Children II
or
- 51.866 Methods and Materials for Teaching Adolescents and
Adults II

Spring Quarter

- 51.805 Student Teaching with Related Seminar
- Applications for Student Teaching must be received by the Director of Field Placement no later than October 15.

This program does not lead to any degree. However, applicants who are able to be full-time graduate students may apply for simultaneous admission to most programs requiring certification in the Graduate School of Education. Such students may take one or two courses in the degree program along with the certification courses (except during the Student-Teaching quarter when no courses may be taken), but must complete certification requirements during the first year of study. Twelve quarter hours (3 courses) taken in the nondegree program may be used as electives in a master's program, subject to approval of the adviser. Students who cannot devote full time to graduate study may apply to master's degree programs after successful completion of the certification program.

This program may also be combined with a master's degree in selected areas of Liberal Arts. For assistance with these details, students should see the Chairperson of the Department of Curriculum and Instruction.

CERTIFICATE OF ADVANCED GRADUATE STUDY PROGRAMS

The Certificate of Advanced Graduate Study is available to applicants who have demonstrated a strong background in the special field of study at the master's level and who meet the specific requirements of the Graduate School of Education and the appropriate department. CAGS programs are offered in the areas of:

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Counselor Education	65
Pupil Personnel Services Administration	65
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Counseling	66
School	66
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Instructional Technology	69
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Cooperative Education Administration	69
Higher Education Administration	70
Instructional Technology Administration	71
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All students must complete one of the programs as outlined in the following pages. In most cases, the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the major adviser and approval of the Director of the Graduate School of Education.

Counselor Education

The CAGS represents a second year of preparation beyond the master's degree for the counseling and human services field. This is not a predoc-toral program but a terminal professional degree program. There are several major options in the Counselor Education Department: Pupil Personnel Services Administration, School Psychology, and Counseling (School, College, Community Mental Health, Rehabilitation). Students with master's degree work in rehabilitation counseling who wish to emphasize administrative preparation at the CAGS level should enter the Rehabilitation Administration program.

Each of these counselor education program concentrations presumes master's level preparation in counseling the equivalent of that offered at the University. Students whose master's program in Counselor Education lacked a practicum will be required to take 53.805-53.806 in addition to the minimum course requirements for the CAGS. Students with master's degrees in fields other than counseling will, if otherwise admissible, be required to make up a minimum of five courses from the master's program. These students will need a minimum of two years to complete the requirements for the CAGS.

In addition to the course requirements, students must pass a comprehensive examination (written and/or oral) before the certificate will be awarded.

After filing all application materials required by the Graduate School, applicants will be contacted by the Department to arrange for admissions interviews. Since there is a limited number of spaces in the CAGS program, early application is urged.

Pupil Personnel Services Administration

Students who have prepared themselves for school counseling positions and who are interested in leadership positions in guidance and pupil personnel services should choose this option. The program provides the opportunity for further work in counseling, but emphasizes administrative and organizational preparation for the effective delivery of personnel services to students. Field work placements give the student the opportunity to develop skills and knowledge in planning, supervision, and delivery of services within the context of the total educational program of the school system.

A typical program is as follows:

- 53.840-53.841 Advanced Field Work
- 53.834 Advanced Theories of Behavior Change
- 53.833 Seminar in Counseling Supervision and In-Service Education
- 53.807 Administration of Guidance Services
- 52.810 Leadership I
- 52.811 Leadership II
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration
- Three Electives

Counseling

Students whose primary interest is the delivery of individual and group counseling services in a variety of settings, including, but not limited to, schools, college counseling centers, rehabilitation, and mental health centers, should choose this option. This program provides for a more "therapeutic" orientation but is not as focused on a particular setting or category of settings. Field placements give the student the opportunity to develop individual and group counseling skills and will be varied according to individual need and interest. Mental health settings will tend to predominate in the field assignments.

A typical program for School, College, and Community Mental Health Counseling is as follows:

- 53.840-53.841 Advanced Field Work
- 53.834 Advanced Theories of Behavior Change
- 53.816 Psychological Counseling Strategies
- 53.818 Case Studies in Marriage and Family Counseling
- 53.831 Advanced Group Counseling
- 53.835 Psychodiagnostic Measures
- 50.819 Theories of Developmental Psychology
- 50.807 Abnormal Psychology
- Three Electives

A typical program for Rehabilitation Counseling is as follows:

- 53.840-53.841 Advanced Field Work
- 53.834 Advanced Theories of Behavior Change
- 53.831 Advanced Group Counseling
- 53.818 Case Studies in Marriage and Family Counseling
- 56.980 Psychological Problems of Disability
- 56.982 Essentials of Case Management and Supervision
- 56.983 Rehabilitation of Alcoholic and Drug Dependent
- 56.984 Rehabilitation of the Penal Offender
- Three Electives

School Psychology

The course offerings and field experiences in this program are designed for students interested in becoming school psychologists. In accordance with present Massachusetts certification requirements, the goal is to help develop professional competencies necessary for providing direct, specific, and practical assistance to students, classroom teachers, parents, and other school personnel in promoting an optimal psychoeducational experience. In addition to the general Certificate of Advanced Graduate Study admission requirements, applicants for the School Psychology program must have at least 24 semester hours (32 quarter hours) of undergraduate work in psychology and a master's degree in a psychology related field.

This specialization is sponsored jointly by the Graduate School of Education and the Department of Psychology in the College of Liberal Arts. Applicants for this program will be interviewed by both the Department of Counselor Education and the Department of Psychology. The admitted student will be assigned an adviser from one of these two departments who will plan the student's program.

Courses to meet requirements will be selected from the Graduate School of Education and the Department of Psychology to reflect the following areas of study: learning theory, counseling strategies and interviewing, psychodiagnosis, remediation, special education, curriculum, organizational development, school structure, psychopathology, human development.

Two years of field experience as a school psychology trainee under the supervision of a certified school psychologist are required.

A typical program is as follows:

- 53.843-53.844 School Psychology Field Work
- 51.870 Developmental Reading and Writing or
- 51.871 Reading and Language Disabilities I
- 56.840 Psychology of Mental Retardation and other Handicapping Conditions
- 19.822 and 19.823 Psychopathology I and II
- 53.835 Psychodiagnostic Measures
- 53.821 Psychoeducational Prescriptions
- 53.820 Seminar in School Psychology
- Two courses in Personality and Development

*Elective(s)

*The number and selection of electives will depend upon the student's master's degree program content and state certification guidelines.

Curriculum and Instruction

The CAGS program in Curriculum and Instruction is offered to educators who have master's degrees and wish to have the opportunity to develop their skills in instruction, program development, and program implementation as teachers and/or supervisors in schools and colleges. Two program options are offered by the Department of Curriculum and Instruction. Option I consists of courses offered primarily or entirely in the Graduate

School of Education. Option II is offered jointly by the Department of Curriculum and Instruction and a department in another College. At this time, a joint program is offered by the Department of Curriculum and Instruction and the Department of English (College of Liberal Arts).

Option I

Students who wish to study about curricular and instructional alternatives and instructional supervision, should choose this option. In addition to completion of course work, students must pass a comprehensive examination.

Required Curriculum and Instruction Core

- 51.881 Seminar in Curriculum: Alternative Designs (51.880, Evolution and Revolution in the School Curriculum is prerequisite.)
- 51.882 Seminar in Instruction: Alternative Designs
- 51.883-.884 Seminar in the State of the Art and Field Project

Electives

A minimum of four Curriculum and Instruction electives according to major area of study from among:

- 51.893-4 Seminar in Supervision of Instruction and Practicum and from among courses in such areas as:
 - Science education
 - Mathematics education
 - Social studies education
 - English-Language arts
 - Reading
 - Adult basic education
 - English to speakers of other languages

Four additional electives selected, with the approval of the adviser, from the department, other departments in the College of Education, or the University at large.

Option II

Students who wish to study further in their content area and also study about instructional alternatives should choose this option. In addition to completion of course work, students must pass a comprehensive examination. At present, a joint program is offered by the Department of Curriculum and Instruction and the English Department.

Required Curriculum and Instruction Core

- 51.882 Seminar in Instruction: Alternative Designs (51.800, Principles of Teaching, or equivalent, is prerequisite)
- 51.883-4 Seminar in the State of the Art and Field Project

Curriculum and Instruction Electives including three courses selected

from among:

- 51.842 The English-Language Arts Curriculum
- 51.843 Literature in the English-Language Arts Curriculum
- 51.844 Writing in the English-Language Arts Curriculum
- 51.848 Language in the English-Language Arts Curriculum
- 51.849 Topics in the English-Language Arts Curriculum
- or other approved courses in the Department of Curriculum and Instruction

English courses (a minimum of six)

Instructional Technology

The department also offers a CAGS program in Instructional Technology. For further information see the Director of the Graduate School of Education.

Educational Administration

Beyond the master's degree level, four advanced administrative programs at the Certificate of Advanced Graduate Study (CAGS) level are offered. These programs are in the fields of cooperative education, educational administration, higher education, and instructional technology.

Cooperative Education Administration

A program of study at the master's level in the area of cooperative education is located in the Counselor Education Department. The program offered here is an advanced one which focuses on administration of cooperative education programs in a variety of settings: the public schools, vocational-technical schools, and junior colleges, as well as at other institutions of higher learning.

A typical program is as follows:

Required Core

- 52.830 Current Issues in Educational Administration
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration
- 51.900 Cooperative Education in America
- 52.824 The Administration of Cooperative Education

Electives

A minimum of seven to be selected in consultation with the student's adviser. These courses will be drawn from the appropriate areas of administration, counselor education, or other related offerings depending upon the student's career goals in settings such as: colleges, junior colleges, public schools, and other educational agencies.

Upon completion of this program, a comprehensive examination is given to each student.

School Administration

The Certificate of Advanced Graduate Study (CAGS) program in Educational Administration is designed to provide the student with a closer examination of a particular administrative or supervisory position. Extending beyond the generic master's degree program, major emphasis is given to role specialization and the particular skills that should be acquired by prospective and practicing school administrators. Study emphasis is given to: the principalship of a large school; the assistant superintendency; the superintendency of a small district or supervisory union; directorship of federal, system-wide or state education department programs.

A minimum of 12 courses beyond the master's degree is required for completion of the program as well as satisfactory completion of a comprehensive examination.

Core Courses (required)

- 52.830 Current Issues in Educational Administration
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration

Electives

A minimum of nine, to be selected in consultation with the student's adviser. These courses will be drawn from appropriate areas of administration and other related offerings depending upon the particular specialization of the student.

Upon completion of this program, a comprehensive examination is given to each student.

Higher Education Administration

This program of study stresses college administration. Emphasis is placed on attitudes, understandings, and skills necessary to administration, as well as the philosophies that may help administrators in their career.

A typical program is as follows:

Required Core

- 52.830 Current Issues in Educational Administration
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration

Electives

A minimum of nine to be selected in consultation with the student's adviser. These courses will be drawn from appropriate areas of administration, counselor education, and other related offerings depending upon the particular higher education specialization of the student.

Upon completion of this program, a comprehensive examination is given to each student.

Instructional Technology Administration

The Certificate of Advanced Graduate Study (CAGS) program in Instructional Technology is designed to provide the student with advanced administrative and instructional technology skills. Four areas of contact are integrated into this advanced program. A broad exposure is presented in the field of educational administration through the core courses. Instructional technology electives should help the student with advanced techniques of using modern technology for instructional purposes. By means of educational administration electives, reasonable depth is available in such areas as finance, physical facilities, and community relations. And finally, by means of additional electives throughout the University, further contacts and expertise may be attained.

Upon completion of this advanced program, the student may assume top leadership in the field of instructional technology in central office positions of a public school system as well as directorship of such specialized programs in industry, government, institutions of higher learning, and privately operated instructional programs in urban settings.

A typical program is as follows:

Educational Administration Core Courses (3)

52.830 Current Issues in Educational Administration

52.831 Innovation and Change in American Public Schools

52.832 The Process of Administration

Instructional Technology Electives (minimum of 4 as approved by the adviser)

Educational Administration Electives (minimum of 4 as approved by the adviser)

Electives (optional number)

Upon completion of the above program, a comprehensive examination is given to each student.

Rehabilitation and Special Education

Rehabilitation Administration

The CAGS Program in Rehabilitation Administration is offered for students who already possess a master's degree in rehabilitation administration or its equivalent. It is intended to give a student the opportunity to develop advanced skills in the areas of program planning, decision making, communication and research design in administration. In addition, the educational experience may be substantively focused in areas of service to fields of corrections, alcohol and drug addiction, geriatrics, and social welfare.

A minimum of twelve courses beyond the master's degree is required for completion of the program. In addition to course requirements and

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demonstration of competencies in both academic and practicum areas, students must pass a written and/or oral comprehensive examination before the certificate will be awarded.

Departmental Core Courses (Required)

- 56.959 Rehabilitation Research and Evaluation
- 56.980 Psychological Problems of Disability
- 56.981 Administrative Problems in Rehabilitation
- 56.986 Critical Issues in Rehabilitation Administration

Electives

- 56.982 Essentials of Case Management and Supervision
- 56.983 Rehabilitation of the Alcoholic and Drug Dependent
- 56.984 Rehabilitation of the Penal Offender
- 56.985 Rehabilitation of the Geriatric Client
- 52.832 The Process of Administration
- 52.836 Personnel Administration
- 52.843 Administrative Internship
- 52.899 Directed Study
- 56.832 Group Dynamics

Special Education Administration

An interrelated program at the CAGS level is designed to give students the opportunity to prepare to be an administrator of Special Education programs in public schools and in local and state institutions and agencies.

Students entering the CAGS program in Special Education Administration must have a master's degree, equivalent to that offered at the University, in one or more areas of special education and at least three years of classroom experience. Some students may have to take prerequisite courses to rectify deficiencies.

Core Requirements

- 52.830 Current Issues in Educational Administration
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration
- 56.953 Organization and Administrative Theory

Department Requirements

- 56.952 Rehabilitation and Social Services
- 56.870 Administration and Supervision of Special Education
- 56.839 Severely Handicapped
- 56.956 Community Planning in Rehabilitation
- 52.843 Administrative Internship
- 56.961 Fiscal Management I
- 56.963 Fiscal Management II

Electives

- 56.832 Group Dynamics
- 52.813 Instructional Leadership: Curriculum Development
and Supervision
- 56.959 Rehabilitation Research
- 52.865 Systems Theory in Education
- 52.835 School Business Management

A minimum of twelve courses beyond the master's degree is required for completion of the program.

In addition to course requirements and demonstration of competencies in both academic and practicum areas, students must pass a written and/or oral comprehensive examination before the certificate will be awarded.

DOCTOR OF EDUCATION

The Doctor of Education (Ed.D.) degree program in Leadership: Administration and Supervision is offered jointly by various departments within the College of Education and brings together a functional part of each into a single entity. The area of study, administration and supervision, is appropriate to any candidate seeking a terminal degree in the related fields of school administration, rehabilitation administration, and higher education administration. Each degree candidate is involved in an academic experience that is an individually developed program of courses and activities. Such study will contribute to an integration of knowledge about the theoretical and pragmatic learnings pertaining to the chosen field of endeavor.

Specific concentrations may be found in elementary and secondary school administration, school central office administration, administration of special education, and pupil personnel administration. In addition to the wide range of school administrative and supervisory specializations, other program concentrations include rehabilitation administration, administration of community, junior and four-year colleges, administration of co-operative education, student personnel administration, and general educational administrative planning and development.

Although each student's program is individually developed, some general requirements apply to all. The program consists of approximately seventy-six quarter hours of study beyond the master's degree. In addition to course requirements, each student is expected to complete three quarters of full-time study in residence. Two of these quarters must be consecutive (one of which may be in the summer quarter), the third may occur at any time in the program or may be fulfilled through a full-time internship. In each student's program, the major field of study must be complemented by two minor areas of study from offerings in the College of Education and other colleges within the University. Each student is expected to complete a doctoral dissertation.

The Doctor of Education degree is awarded to candidates who present evidence of proficiency, high attainment, and research, competence in their area of specialization, and who also demonstrate potential for professional educational leadership.

Following is the general type of program format that will be developed for each student.

PROGRAM OF STUDIES

Leading to the Doctor of Education Degree in Leadership: Administration and Supervision

Courses

Required Core (required of all students)

- 52.850 Doctoral Seminar in Leadership: Administration and Supervision I
- 52.851 Doctoral Seminar in Leadership: Administration and Supervision II
- 52.852 Doctoral Seminar in Leadership: Administration and Supervision III

Program Specialization (minimum of 32 quarter hours)

A planned sequence of courses in the student's specific area of concentration, i.e.,

- School Administration
- Rehabilitation Administration
- Higher Education Administration
- Cooperative Education Administration
- Special Education Administration
- Pupil Personnel Administration

Outside Minor Supporting Area (minimum of 12 quarter hours):

A planned sequence of graduate courses from departments within the University, but outside the College of Education.

Inside Minor Supporting Area (minimum of 12 quarter hours):

A planned sequence of graduate courses within the College of Education, but outside the student's main area of concentration.

Dissertation and Dissertation Seminar (required of all students).

In addition to these general program requirements, each student will be expected to complete a qualifying examination, provide evidence of intermediate statistical proficiency, pass final comprehensive and oral examinations, and complete three quarters of residency. These requirements are described elsewhere in the catalog.

description of courses

All courses carry four quarter hours of credit unless indicated otherwise. Please see the current schedule for Summer, Fall, Winter, and Spring Quarter listings.

FOUNDATIONS OF EDUCATION

50.801 Educational Anthropology

Examination of schooling as a particular variety of socialization, with special attention to characteristics of societies that rely heavily on formal instruction, contrasted with less deliberately patterned techniques of child rearing. Readings will be mainly cross-cultural, ethnographic, and historical. The emphasis of the course varies from quarter to quarter, and will be announced in the registration materials distributed in advance of each quarter. (core course)

50.802 Sociology of Education

The functioning of educational institutions in their social and cultural milieu will be examined from anthropological and sociological perspectives. The school as a social system; influence of the stratification system, youth cultures, and racial antagonisms upon the educational enterprise. (core course)

50.803 Child Psychology

A review of the principles of child development from birth to preadolescence. Particular emphasis will be placed on intellectual, social, and emotional development. The theoretical formulations of psychoanalysis, social learning theory, and Piaget will be discussed in the context of relevant research in these areas, as well as their educational implications. (core course)

50.804 Adolescent Psychology

Social, emotional, and intellectual development through the adolescent years. Problems in family relationships and in the adolescent's social environment as well as his adjustment in school. Case history material. (core course)

50.805 Personality and Social Structure

Human behavior from a combined psychodynamic and sociological point of view, with special emphasis on socialization and the relations between the individual and the collectivity. The integration of relevant theories from psychology, sociology, and anthropology. *Suggested Prep. a course in sociology, cultural anthropology, or social psychology.* (core course)

50.806 Psychology of Learning

The basic principles and conditions of acquisition, retention, and transfer of learning. *Suggested Prep. a course in psychology.* (core course)

50.807 Abnormal Psychology

A historical overview leads to contemporary views on how human personality becomes disordered and maladaptive. Principal emphasis is on the development of psychopathology during the course of development. A perspective is developed for viewing the economy of psychological deviations. Neuroses, transient states, and psychophysiological reactions are considered, each with a clinical picture, typical course, and outcomes. Some consideration is devoted to current methods of diagnosis and treatment. (With the approval of the adviser, may serve as a core course for students majoring in Counselor Education, Rehabilitation Administration, Special Education, Speech Pathology and Audiology.)

50.808 Seminar in Child Development

A seminar course with emphasis on discussion of child development theories with special reference to personality and cognitive development. Critical evaluation of research related to child development theories with particular emphasis on recent trends, new approaches, and relevance to educational theories and practices. *Prep. a course in child psychology or human development.* (core course)

50.809 Seminar in Adolescent Development

A seminar course with emphasis on discussion of major problem areas facing the adolescent in our society today. Particular emphasis will be given to social and emotional development. Included will be a survey of research in such areas as psychoanalysis, social learning, morality, and delinquency. *Prep. a course in adolescent psychology or human development.* (core course)

50.810 Psychology of Personality

A systematic consideration of the personality theories of Freud, Jung, Adler, Sullivan, Horney, Cattell, Allport, Rogers, and a few other approaches including the psychosomatic of Alexander and the work of Reich. Theories are considered in depth and examined for ways that contribute to an understanding of dynamic factors in personality formation. Theories and theorists are compared for a greater understanding of strengths and weaknesses. Social, cultural and philosophic questions are discussed. Implications of some of the ideas and theories for the therapeutic process will also be considered. *Suggested Prep. at least one and preferably more courses in psychology.* (core course)

50.811 Psychology of Thinking

A consideration of the processes involved in cognitive organization and functioning. Topics will include: language, concept formation, and problem solving. *Suggested Prep. a course in psychology.* (core course)

50.812 History of Education

An opportunity to explore some of the historical roots of contemporary educational theory and practice, with a focus on selected aspects of educational history from antiquity to the present. Also, an opportunity to utilize knowledge gained for the development of a personal educational position. (core course)

50.814 Nature and Theory of Psychological and Educational Measurement

An examination of the logic of measurement and the nature of human capacities, aptitudes, and abilities. Characteristics of tests, ratings, questionnaires, and similar instruments are reviewed with emphasis on their reliability, validity, and useability. Item analysis procedures and test standardization are covered.

50.815 Research Design in Education

An introduction to scientific methods of research in education and related fields. Stress will be placed on critical reading and understanding of research literature, formulating research hypotheses, constructing a research proposal, and carrying out an individual or group project. This course must be included among the first six courses taken by each student. (core course)

A course in statistics, or competence in this field, as demonstrated by successful completion of a statistics proficiency exam, is required prior to taking this offering. A no-credit, no-charge programmed course in statistics has been arranged for this purpose and is available through the Learning Resource Center, 406 Dodge. The regular tuition course, 50.841, is also available. Students choosing the proficiency exam route may also use the services of a special teaching assistant who has been appointed to advise and assist them. The office hours and location of the teaching assistant will vary from quarter to quarter and may be obtained from the Foundations Department Secretary in 306 Cushing.

50.817 Advanced Research Design

This course focuses on methodologies for collecting, interpreting, and evaluating data and deals with biases encountered in the data collection process. Topics such as data collection and interpretation, using sampling, analysis of variance, covariance, multiple regression, multivariate procedures, and advanced topics in scaling, semantic differential methodology, questionnaire design, interview methodology, and evaluative criteria will be featured. Students enrolling for this course will design and complete a proposal on this design for the conduct of a research project. This project may be carried out as part of research on either the master's or doctoral level. *Prep. 50.842 Intermediate Educational Statistics or equivalent or permission of instructor.*

50.818 Comparative Education

Introduction to education in other nations, and exploration of its relationships with the political, economic, social, and cultural milieu. Selected countries in Western and Eastern Europe, South America, and Africa will be considered. (core course)

50.819 Theories of Developmental Psychology

The major developmental theories and related research of Havighurst, Erickson, Piaget, and others. *Prep. permission of instructor.*

50.820 Seminar in Contemporary Issues in American Education

Discussion of selected issues in contemporary American education such as school desegregation, compensatory education, learning problems of the disadvantaged, professionalization of teachers, etc. Review of relevant research and opinions. The topic or topics of the seminar for a particular quarter will be announced in the registration materials distributed in advance of that quarter. (core course)

50.821 Sex Roles in Education

This course identifies and examines some of the major issues related to sex roles in both the formal and informal educational systems of our society. Topics that will come under special scrutiny include: development of sex role patterns in the home and preschool and through children's books, games, and television programs; life for boys and girls in the elementary and high school classroom; sex bias in counseling

and in vocational guidance and training; changes in traditional family roles and occupation hierarchies; assets and liabilities of coeducational and single-sex education. The course may also allow students, in small groups, to explore their own sex role attitudes and the strategies they use to socialize young people.

50.822 Topics in the Philosophy of Education

A study of the basic assumptions underlying statements of educational content, process, and aims. Materials to be subjected to philosophical analysis are selected from educational and philosophic writings according to themes (e.g., authority and freedom, "growth" as an educational objective, the nature of educational relationships). The themes dealt with vary from quarter to quarter, depending on the concerns and interests of students and instructor. Brief lectures, mostly discussion. (core course)

50.823 Education and Equality

An investigation into the reciprocal relationship between American educational institutions and the equality-inequality dimension of American social structure. Both the traditional view, which celebrates the American public school as a triumph of equalitarianism, and the revisionist view, which emphasizes inequalitarian consequences of American educational practice, will be discussed. (core course)

50.841 Introduction to Educational Statistics

Basic descriptive statistics for measurement and research. Topics include use of statistical notation, measures of central tendency and variability, probability and sampling techniques, theoretical distributions, linear regression and correlation, and an introduction to statistical inference. (This course, or completion of a statistics proficiency examination, is required for admission to 50.815 Research Design in Education.)

50.842 Intermediate Educational Statistics

Statistical inference of normal populations and discrete data; estimation; testing of hypotheses; multiple correlation; analysis of variance and covariance; contingency; the chi-square test and other nonparametric tests. Emphasis is given to application in educational research. *Prep. completion of an introductory course in statistics or completion of a proficiency examination in statistics or permission of instructor.*

50.845-846 Independent Research Seminars I and II (4 quarter hours each)

Focus is on the design, conduct, analysis, and reporting of data from an individual research project. This project may be original or secondary, applied, theoretical, or action research and must be substantially larger in scope than that accommodated by Directed Study. Evaluation will be based on oral and written interim reports in Seminar I and oral and written final reports in Seminar II. This course will serve as an option to the thesis requirement only for students enrolled in the master's degree program in Educational Research.

50.847 Introduction to Computer Programming: FORTRAN IV

A laboratory course designed to develop facility in the use of a wide range of data processing equipment in educational research. Students will be introduced to the basic principles of computer programming, but emphasis will be placed on the applicability and use of existing statistical programs.

50.850 Communications Theory

An introduction to communications theory, covering models of the communication process, attitude changes, information, innovation, dissemination and flow, communication modalities, and language processing. (core course)

50.852 Cross-Cultural Perspectives on Work

The course will examine diverse cultural perspectives on work and current theories as to the sociological significance of these differences. Although a major emphasis will be placed on the contrasts between traditional and modern societies and on transitional societies in the Third World, some attention will be devoted to work-related issues in contemporary industrialized societies.

50.891 Thesis

A research activity that may be selected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

50.892 Dissertation Seminar

This seminar is open only to doctoral candidates who are ready to begin work on their dissertations. Although the dissertation proposal is formulated independently of the seminar, with the doctoral adviser and committee, this seminar will aid in proposal development and provide information on methodology, style, and mechanics of dissertation writing. *Prep. course in research methods in education (50.815 or equiv.) or permission of the instructor.*

50.895 Institute in Foundations of Education

(See general institute description on page 115.)

50.898 Workshop in Foundations of Education

(See general workshop description on page 115.)

50.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. Not available to special students. *Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

CURRICULUM AND INSTRUCTION

51.800 Principles of Teaching

A consideration of the rational bases for effective teaching. Efforts are made to relate learning theory and educational objectives to various strategies and tactics of teaching. The functions of the teacher are examined as components of learner development. *Prep. must be taken concurrently with 51.863 Methods and Materials for Teaching Children I or 51.865 Methods and Materials for Teaching Adolescents and Adults I. Offered Fall Quarter only.*

51.801 Curricula of American Schools

Methods of organizing material to be learned at the state, district, school, and classroom level to meet the needs and to match the abilities of the students. Atten-

tion will be given to innovative practices which are found both within and outside of the public school system. *Prep. 51.800 Principles of Teaching; must be taken concurrently with 51.864 Methods and Materials for Teaching Children II or 51.866 Methods and Materials for Teaching Adolescents and Adults II.* Offered Winter Quarter only.

51.802 Procedures of Evaluation

Consideration is given to evaluation as a process for the improvement of learning and instruction. The course concerns itself with such topics as how to measure and evaluate effective, psycho-motor, and cognitive dimensions of student growth; test construction; collecting and administering standardized tests; various bases of grading; and methods of reporting student progress.

51.805 Student Teaching with Related Seminar

(8 quarter hours)

A University-arranged practicum of observation and teaching in schools offering comprehensive programs within reasonable commuting distance of the University. Participating on a full-time basis, the student is expected to develop planning and communication abilities within his major field. Biweekly seminars at the University provide additional opportunity to analyze theory-practice relationships and to examine generic problems of teaching. *Prep. course in child or adolescent psychology; 51.800 Principles of Teaching; 51.801 Curricula of American Schools; 51.863-864 Methods and Materials for Teaching Children I & II or 51.865-866 Methods and Materials for Teaching Adolescents and Adults I & II.* Generally completed during the Spring Quarter. (Open only to students in the Nondegree Certification Program.)

51.825 Seminar in Mathematics Education

Each student is expected to analyze a mathematics learning problem, to investigate relevant research, and to prepare materials embodying his own proposed solution. *Prep. permission of instructor.*

51.830 Concepts of Earth Science for Elementary Teachers

Selected topics in the earth sciences considered from a philosophical and/or historical point of view to illustrate and emphasize man's interrelationship with his ecological environment; with laboratory work. Offered in part on the Allagash Wilderness Waterway in alternate summers. (51.830, 51.831, and 51.832 are not sequential, and may be taken in any order.)

51.831 Concepts of Biology for Elementary Teachers

Selected topics in the biological sciences considered from a philosophical and/or historical point of view; a realistic consideration of man's place in his biological world; with laboratory work. (51.830, 51.831, and 51.832 are not sequential, and may be taken in any order.)

51.832 Concepts of Physical Sciences for Elementary Teachers

Selected topics in the physical sciences considered from a philosophical and/or historical point of view; the appraising of claims and counterclaims relative to the pollution of man's physical environment; with laboratory work. (51.830, 51.831, and 51.832 are not sequential, and may be taken in any order.)

51.837 Curriculum Problems in Science and Mathematics Education

The process of identifying problems and evaluating proposed solutions, taking into

consideration the needs of the student population, the dichotomy of theory and applications in course design, and the role of common processes and conceptual schemes in integrating seemingly disparate courses. Traditional and modern programs will be investigated in terms of the problems they were designed to solve, their success or failure in this mission, and the relevance of such programs to present problems. *Prep. teaching experience or certification.*

51.838 Seminar In Science and Mathematics Teaching

The analysis and evaluation of a number of types of teaching strategies and learning materials, including laboratory materials and techniques, printed matter of all types, games, kits, multimedia materials, and interactive computer programs. Each student will be expected to undertake an extensive project applying his knowledge of strategies and materials to the achieving of previously identified objectives and appropriate to a given class, group, or individual student. *Prep. teaching experience or certification.*

51.839 Implementing Change In Science and Mathematics Education

The planning, organization, and execution of in-service experiences for teachers, related to all phases of science and mathematics education from subject matter courses to curriculum planning to materials workshops. *Prep. teaching experience or certification.*

Recommended: 51.837 Curriculum Problems in Science and Mathematics Education, 51.838 Seminar in Science and Mathematics Teaching, and 51.881 The Dynamics of Curriculum Development.

51.842 The English-Language Arts Curriculum

The design and function of the English-language arts curriculum; selected current issues as they impinge upon the English-language arts curriculum; the design and function of research in the English-language arts curriculum. Open to certified or experienced teachers; required of all candidates for the Master of Education in Curriculum and Instruction: English, and the Master of Education in Curriculum and Instruction: Language Arts. *Prep. permission of instructor.*

51.843 Literature In the English-Language Arts Curriculum

The historical-social, psychological, personal, archetypal, textual, biographical, and philosophical-moral aspects of literary study and their relation to the chronological, thematic, and generic demands of the literature program; the sources of interest in literature as they relate to the young reader and their implications for the English-language arts curriculum; the interrelatedness of literature and the other components of the English-language arts curriculum. Each student will identify and investigate an area of individual interest. *Prep. 51.842, The English-Language Arts Curriculum or permission of instructor.*

51.844 Writing in the English-Language Arts Curriculum

The cognitive and effective bases of imaginative and nonimaginative writing; the role of writing in the relationship between self and object; modes of imaginative and non-imaginative writing appropriate to the young writer; the impulse to expression in the young writer and its implications for the English-language arts curriculum; the inter-relatedness of writing and the other components of the English-language arts

curriculum. Each student will identify and investigate an area of individual interest. *Prep. 51.842, The English-Language Arts Curriculum or permission of instructor.*

51.846 English as a Second Language I

First course in teaching ESL, introducing the basic linguistic, cultural, and psychological concepts. Analysis of current approaches to teaching ESL locally and internationally from the standpoint of diagnosis, grouping, use of particular methods, and materials. Observations of local ongoing ESL programs will be included. *Prep. 51.871 Reading and Language Disabilities I or permission of instructor.*

51.847 English as a Second Language II

Second course in the ESL sequence which emphasizes innovative means in teaching ESL. Specific projects according to student need and interest will be developed; supervised clinical work. *Prep. 51.846 English as a Second Language I.*

51.848 Language in the English-Language Arts Curriculum

An examination of the multiple dimensions of language study in the English-language arts curriculum; the role of inquiry in the study of language and its implications for the English-language arts curriculum; theories of grammar and their relation to the study of language in the English-language arts curriculum; the interrelatedness of language and the other components of the English-language arts curriculum. Each student will identify and investigate an area of individual interest. *Prep. 51.842, The English-Language Arts Curriculum or permission of instructor.*

51.849 Topics in English-Language Arts Education

An investigation of a matter of immediate concern to English-language arts education, but for which no organized study is ordinarily available. Typical topics are: media in the English-language arts program; behavioral objectives in the English-language arts program; the English-language arts program for the disadvantaged. Each year the seminar topic for that year is announced prior to registration.

51.851 Seminar in Current Issues in the Social Studies

A content approach to problems of political, economic, and social significance which have contemporary relevance for teachers of the social sciences.

51.853 History and the Social Studies in the School Curriculum

Permits the student to explore some of the fundamental concepts of anthropology, sociology, economics, political science, and history. Emphasis will be given to the interrelatedness of disciplines and to the extraction of operating principles from those that aid in the analyses of social problems. As a consequence of such analyses, the student should be equipped to find a greater variety of conceptual relationships within the historical social science field. From there a framework for evolving courses of study may be generated. *Prep. teaching experience or certification.*

51.854 Social Science Materials Seminar

A curriculum course wherein the knowledge previously acquired will be used to establish criteria for the selection and development of curriculum materials. All materials of instruction will be viewed as means of implementation of objectives relating to specific social science concepts and skills. An effort will be made to personalize and concretize abstract phenomena and to demonstrate their impact on the

quality of human lives. Students will examine and analyze prepared curricula and will be asked to develop original materials that include provision for the integration of a variety of thinking, reading, and social skills. *Prep. teaching experience or certification.*

51.863 Methods and Materials for Teaching Children I

Teaching methods and learning materials used in teaching children in a number of educational settings. This course will help students establish objectives, plan and execute appropriate learning experiences, and evaluate outcomes. *Prep. must be taken concurrently with 51.800 Principles of Teaching.* Offered Fall Quarter only. (Open only to students in the Nondegree Certification Program.)

51.864 Methods and Materials for Teaching Children II

A continuation of 51.863. *Prep. 51.863 Methods and Materials for Teaching Children I; must be taken concurrently with 51.801 Curricula of American Schools.* Offered Winter Quarter only. (Open only to students in the Nondegree Certification Program.)

51.865 Methods and Materials for Teaching Adolescents and Adults I

Teaching methods and learning materials used in teaching adolescents and adults in a number of educational settings and for a number of purposes. The course will help students identify objectives, plan and execute appropriate learning experiences, and evaluate outcomes. *Prep. must be taken concurrently with 51.800 Principles of Teaching.* Offered Fall Quarter only. (Open only to students in the Nondegree Certification Program.)

51.866 Methods and Materials for Teaching Adolescents and Adults II

A continuation of 51.865. *Prep. 51.865 Methods and Materials for Teaching Adolescents and Adults I; must be taken concurrently with 51.801 Curricula of American Schools.* Offered Winter Quarter only. (Open only to students in the Nondegree Certification Program.)

51.867 Remediation in Mathematics

An effective approach to the teaching of mathematics; diagnosis and remediation of difficulties, alternative teaching methods, techniques for the improvement of student skills and of student attitudes toward mathematics.

51.870 Foundations of Reading

Reading and writing as the receiving and generating of language; current developmental reading, writing, and related language skills; selected research findings bearing on relevant topics. Required of candidates for Master of Education in Curriculum and Instruction: Reading Certification; Curriculum and Instruction: English; Curriculum and Instruction: Language Arts. *Prep. permission of instructor.*

51.871 Reading and Language Disabilities I

Reading and language disabilities; causes and correlates of disability; language differences; aspects of measurement; diagnostic and corrective procedures in reading, writing, and related language skills; selected research findings bearing on relevant topics. Required of candidates for Master of Education in Curriculum and Instruction: Reading Certification; Curriculum and Instruction: English; Curriculum and Instruction: Language Arts. *Prep. 51.870 Developmental Reading and Writing.*

51.872 Literature and Materials Seminar

Literature for children, adolescents and adults; the sources of interest in literature as they relate to the reader; the interrelatedness of literature and the other components of the language arts program; investigation of materials available. Students will develop projects related to their needs and interests. Required of candidates for Master of Education in Curriculum and Instruction: Reading Certification; Curriculum and Instruction: English; Curriculum and Instruction: Language Arts.

51.873 Reading Clinic I

Practicum in clinical experience. Children and adults with severe reading disabilities will be tutored in the Reading Clinic twice a week for 1¼ hours each session, under close staff supervision. A one-hour seminar will follow each tutoring session for purposes of discussion and case presentation. A diagnosis, lesson plans, daily logs, complete case history, and a final progress evaluation will be required of each student. May be taken concurrently with 51.871. *Prep. 51.870 Developmental Reading and Writing.*

51.874 Reading and Language Disabilities II

Second course in Reading and Language Disabilities, including an examination of selected models of language processes; cognitive and effective dimensions; problems in language pathology; and other learning disabilities including academic, perceptual-motor, and neurological areas. *Prep. 51.871 Reading and Language Disabilities I and 51.873 Reading Clinic I.*

51.875 Reading Clinic II

A continuation of the Practicum. Requirements and format will be the same as Clinic I. May be taken concurrently with 51.874. *Prep. 51.871 Reading and Language Disabilities I and 51.873 Reading Clinic I.*

51.876 Teaching Reading in Junior and Senior High School

Developmental or corrective reading programs at the secondary level. Development of reading rate, comprehension, interpretation, and study skills in the content areas.

51.877 Language and Reading

Introductory course in linguistics with emphasis on implications for reading and language instruction. Topics included are the nature of language, introduction to the development of syntax, phonology and semantics, English orthography, the grammar of child language, and dialectology. *Prep. 51.870 Foundations of Reading or consent of instructor.*

51.878 Current Issues in Reading and Language

Three or four topics of current interest in reading and language education are investigated in depth over a three- or four-week period each during the quarter. Typical topics might include lectures and readings on: Sexism in Reading Materials, Chapter 766 and its Implications for Reading and Language Education, "Back to Basics," Reading and Language in the Open and Alternative Education Program, Problems of Illiteracy, Bilingual and Bicultural Education and Reading/Language Instruction.

51.880 Evolution and Revolution in the School Curriculum

Examination of the curriculum of the American school as an expression of conflict between subject-centered and student-centered curricula, traditionalists and revisionists, behaviorism and psychodynamism, and the interplay of forces generated by students, teachers, administrators, and other interested groups. Present school curricula will be analyzed as the outcomes of such conflicts and trends for the future development of school curricula will be hypothesized. *Prep. teaching experience or certification.*

51.881 Seminar in Curriculum: Alternative Designs

Identification and analysis of problems in curriculum and instruction in light of the forces affecting the curriculum within the student's area of specialization; design and implementation of solutions to such problems; evaluation and field testing where feasible, of these solutions. *Prep. 51.880 Evolution and Revolution in the School Curriculum.*

51.882 Seminar in Instruction: Alternative Designs

Methods of inventing or adapting methods of teaching to make them appropriate to the demands of the curriculum, the needs of the students, the capabilities of the teachers, the expectations of the community and the resources of the school or college. This course will help the student identify the criteria by which instructional practices may be selected, by which they may be evaluated, and by which they may be developed. Instructional practices include methods of teaching, designing learning materials, grouping students, pacing, scheduling, evaluating, and so forth. Students will have the opportunity to revise existing resources and to create new resources for instruction in order to make the implementation of a specific curriculum more effective. *Prep. (except for students in joint programs with a department in another college) 51.881 Seminar in Curriculum: Alternative Designs (may be taken concurrently); prep. for students in joint programs with a department in another college is 51.800 Principles of Teaching or equivalent.*

51.883-884 Seminar in the State of the Art and Field Project (8 quarter hours)

These courses consist of examination of the current curricular and instructional issues in specific teaching areas or levels; hypothesizing and projecting possible future directions in curriculum and instruction in these areas; integration of the results of these inquiries into coherent understandings of the state of the art in these areas and the development of a special project to be implemented by the students within the context of their own teaching experiences. Seminars will be held over a period of two quarters every other week. *Prep. teaching experience.*

51.888 Seminar: Ethnicity and Today's School Curriculum

Students will briefly review aspects of the history and culture of some ethnic groups to explore the unique manner in which certain universal needs are manifested. Prepared curricular materials, as well as authentic literary, visual, and artifact materials, will be analyzed, evaluated, and related to developed criteria, goals, and potential curricular impact in projecting the aforementioned cross-cultural needs or themes. Students will be asked to select, organize, and as necessary, develop independent materials and strategies, appropriate for classroom use. Efforts will be made to categorize developed units of work on various ethnic groups which appear to have significant parallel dimensions according to predetermined categories.

51.891 Thesis

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

51.893-894 Seminar in Supervision of Instruction and Practicum (8 quarter hours)

Students apply in a field setting the skills learned in the seminar. Student field work is supervised by an on-site person and a professor. At periodic seminars projects are selected and discussed. Students plan the projects and implement these in the field. Students also plan and carry out a project evaluation. (Must be taken in consecutive quarters.)

51.895 Institute in Elementary Education

(See general Institute description on page 115.)

51.896 Institute in Secondary Education

(See general Institute description on page 115.)

51.897 Workshop in Elementary Education

(See general workshop description on page 115.)

51.898 Workshop in Secondary Education

(See general workshop description on page 115.)

51.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Not available to special students. Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

51.911 International Perspectives on Teaching and Learning

This course will deal with categories of learning experiences and modes of acquisition of learning. Developmental needs of learners and their relationship to prevailing pedagogical patterns and societal problems in cross-cultural settings will be emphasized. African, Asian, European, and Latin-American cultures may be used as contexts for analysis of the aforementioned issues.

51.912 International Perspectives on Curricular Planning and Development

This course will involve students in assessing cross-cultural curricular planning and development, assumptions underlying particular principles, and the processes and problems that are related to curriculum organization in developing, industrialized, and agrarian societies. Students will establish criteria for experientially based curricula in both formal and informal educational settings. They will apply the criteria developed to assessment of curricular patterns already in existence and to new models that they develop to meet academic and other societal needs within their own cultures.

51.920 Methods and Materials in Adult Literacy Education

This introductory course includes a review of current ABE programs around the country with particular emphasis on the programs in Boston, e.g., OIC (Opportunities

Industrialization Center), New Urban League, WIN (Work Incentive Program), and public school programs for adults. This review of the programs will include a study and some observation of ongoing programs in the area, especially the WIN program presently being run by the University. Specifically, students will discuss, observe, and study various approaches to ABE programs in terms of curriculum, methodology, materials used, groupings, and evaluation.

A major objective of the course will be to become more aware of the psychological problems of adult readers and nonreaders. Adult behavior and learning will be studied; the effects on learning of particular environmental forces (e.g., black ghetto, Indian reservation, rural-urban factors, etc.); methods of teaching adults at various levels will be studied and observed, as will a wide range of currently available books and materials for adult programs. All students may do some supervised clinical work with adults in the Reading and Learning Clinic; logs will be kept on the diagnostic and corrective work developed for each student. *Prep. permission of instructor.*

51.930 Selection and Utilization of Instructional Material

This course deals with all aspects of instructional media, surveying types, techniques, advantages, limitations, sources, and methods of use of materials and equipment in specified areas. Emphasis is on the selection of appropriate media (print and non-print) to suit given learning objectives. Laboratory experience in operation of equipment and the production of instructional materials is provided.

51.931 Developing Multimedia Learning Packages

During this course each student will produce a multimedia (print and nonprint) instructional package for individualized learning.

51.932 Introduction to Instructional Television

This course concerns the study of the operation of an instructional television studio and the production of television programs for direct instruction. Students will write, direct, and evaluate a short television program in any curriculum field and area of their choice.

51.933 Principles of Programmed Learning

This course will cover the development and current status of selfinstructional multimedia materials and programs. Students will survey available media, programs, and devices.

51.934 Supervision and Coordination of Instructional Media Programs

This course addresses itself to the various aspects and problems involved in the management and operation of educational media programs. Public school, university, medical center, commercial, and industrial training program settings are considered in terms of service, instruction, and research.

51.935 Foundations of Instructional Communication and Technology

Introduction to the concepts and principles of the learning process, communications, multimedia instruction and instructional systems. Surveys may include programmed instruction, instructional television, games and simulation, audiotutorial laboratories, computer assisted instruction (CAI), computer managed instruction (CMI), curriculum learning packages, mediated teaching units, individualized instruction, performance contracting, validated instruction, and criterion referenced testing.

Discussion will involve problems of administration and economics of instructional communications and technology in school systems and training centers.

51.936 Principles of Instructional Systems Development

Introduction to the concept of a system as it relates to the instructional process. Students will select a problem in any area of their choice and conduct a complete systems analysis and systems synthesis to resolve the problem. The contributions of the behavioral sciences as they relate to systems development will also be reviewed.

51.937 Seminar in Media Research and Learning

Provides for surveys, critical analyses, and discussions of current research dealing with learning principles, communication theory, media, and instructional systems design. Oral and written reports are required.

51.938 Developing Multimedia Learning Packages (Advanced)

Using the instructional development techniques acquired in the introductory course, each student will design a more sophisticated multimedia learning package, field test it, and using the test data, revise the package until the predetermined criteria are met.

51.939 Cataloging and Classification of Instructional Materials

The principles, codes, and techniques utilized in organizing both print and nonprint materials in an integrated collection. Emphasis on the application of bibliographic methods of control to films, records, slides, cassettes, kits, and other media. Acquaintance with the sources and tools, listing instructional materials for the purpose of ordering them, and the development of the skill that assists the user in locating them.

51.940 Principles of Programmed Instruction

The development and current status of self-instructional devices. A survey of available programs and teaching machines, including audiovisual machines, with emphasis on the details of the construction and evaluation of programs.

EDUCATIONAL ADMINISTRATION

52.805 Simulated Problems: Secondary School Administration

The workshop is designed to place each student in a simulated decision-making situation as a principal or administrator of a secondary school. Background materials have been prepared which describe all aspects of a school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socioeconomic makeup. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in the community, as well as through written materials. *Prep. 52.810, 52.811, or permission of instructor.*

52.806 Directed Field Experiences in the Administration of the Elementary School

Required of all master's candidates who major in school administration. Study and discussion of administrative functions will be coordinated with selected field trips to administrative settings and with guest lectures by practicing elementary school administrators. These experiences usually involve visits to such settings as: an elementary school, a middle school, a superintendent's office, a school committee meeting,

and appropriate federal and state agencies. In addition, each student will be expected to participate in an administrative field experience in an elementary setting for a minimum of four hours per week. *Prep. 52.810 or permission of instructor.*

52.807 Directed Field Experiences in the Administration of the Secondary School

A companion course to 52.806; required of all master's candidates in school administration. Study and discussion of administrative functions may be coordinated with selected field trips to administrative settings and with guest lectures by practicing secondary school administrators. These experiences are aimed at educational agencies at the secondary level and may include visits to a comprehensive high school, a junior high school, a regional vocational-technical school, a superintendent's office, a school committee meeting, and appropriate federal and state agencies. In addition, each student will be required to participate in an administrative field experience in a secondary school for a minimum of four hours each week. *Prep. 52.810 or permission of instructor.* (52.807 may be a continuation of 52.806 or may precede it.)

52.808 Seminar in Educational Administration

A culminating experience for students majoring in school administration at the master's level. A student is confronted with major issues facing the school and its administrators. Great emphasis is placed upon applying knowledge gained in previous administrative courses to an understanding of contemporary education problems. *Prep. 52.810, 52.811, or permission of instructor.*

52.810 Leadership in Education, Part I

Part I of a two-term core course designed to introduce the student to concepts of formal organization. This core, consisting of a two-part sequence, is prerequisite to further study in the Department of Educational Administration. Part I may provide the student with an overview of formal organizations as social systems, with emphasis given to the leadership function. Relationships between individuals and organizations are considered. Communications and decision-making functions are analyzed and examined.

52.811 Leadership in Education, Part II

Part II continues an emphasis on the leadership function in organizations. It examines selected informal organization elements such as motivation, normative order, social power, conflict, conformity, and creativity. Attention is given to processes of change and innovation in organizations. *Prep. 52.810 must be completed before enrollment in 52.811.*

52.813 Instructional Leadership: Curriculum Development and Supervision

Views the responsibilities of administrative personnel relating to the improvement of curricular and instructional practices. Evaluative techniques, in-service education, supervisory procedures, and innovative programs are among the areas of consideration. Opportunities may be extended for students to become engaged in supervisory projects individually or in small teams. *Prep. 52.810 and 52.811, or permission of instructor.*

52.814 Simulated Problems: Elementary School Administration

The workshop is designed to place each student in a simulated decision-making situation as a principal or administrator of an elementary school. Background

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materials have been prepared which describe all aspects of a school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socioeconomic makeup. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in the community, as well as through written materials. *Prep. 52.810, 52.811, or permission of instructor.*

52.815 Simulated Problems: Administration of Occupational and Career Education

Each student is confronted with a series of simulated decision-making situations such as those which are usually faced by administrators of programs in the area of occupational and career education. Readings, audiovisual material, and class interactions constitute the design of this course.

52.816 Seminar in Occupational and Career Education

Students will be confronted with a sampling of the major issues facing administrators and supervisors of occupational and career education programs in their efforts to organize, promote, and operate such programs. Emphasis will be placed on applying the knowledge acquired in previous courses and other program experiences to arrive at an understanding of contemporary occupational and career education problems and their solutions.

52.824 Administration of Cooperative Education

An examination of significant elements in the planning, implementation, and operation of a cooperative education program. Areas of concern include: agents for institutional change, intrainstitutional relationships, program costs and funding sources, cooperative education calendars, development of cooperative work assignments, relationships with cooperative employers, and operational policies.

52.826 Administration of the Elementary School

A survey of the operational tasks performed by the elementary school administrator. Included will be: school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure. *Prep. 52.810, 52.811, or permission of instructor.*

52.827 Administration of the Secondary School

A survey of the operational tasks performed by the secondary school administrator. Included will be: school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure. *Prep. 52.810, 52.811, or permission of instructor.*

52.828 Administration of Early Childhood Education

This course will include the study of significant elements of administration unique to the planning, implementation, and operation of an early childhood education center. Areas of concern are funding sources, intrainstitutional relationships, patterns for designing early childhood programs, on-site visitations, modes of private governance, use of plant, student and teacher placement, role of volunteers, and related topics. *Prep. 52.810 and 52.811.*

52.891 Thesis

A research activity that may be selected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

52.895 Institute in Educational Administration

(See general institute description on page 115.)

52.898 Workshop in Administration

(See general workshop description on page 115.)

52.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Not available to special students. Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

CAGS AND DOCTORAL COURSE OFFERINGS IN EDUCATIONAL ADMINISTRATION

(Open only to CAGS and doctoral degree candidates or by special permission of the chairman of the Department, granted prior to registration.)

52.830 Current Issues in Educational Administration

A seminar required of all students pursuing the CAGS. Critical and contemporary issues which face school administrators will be examined closely. The status of the administrator; federal, state, and local revenue sources; accountability; the voucher plan; teacher militancy; equal educational opportunity; conflicts with religious organizations; control of schools; urban education problems; cultural deprivation; and human rights are examples of topics that will be analyzed.

52.831 Innovation and Change in American Public Schools

A seminar required of all students pursuing the CAGS. Although major emphasis will be given to curriculum and instruction, attention will also be given to planned change in other critical areas such as team teaching, modular scheduling, nongradedness, educational parks, programmed instruction, in-service education, individualizing education, and teacher-learner relationships.

52.832 The Process of Administration

Simulation, case analysis, and role playing will be utilized to gain insight into such topics as the improvement of organizational morale, professional job satisfaction, and current issues of involvement and conflict. Alternative courses of action are studied to cope with problematical events confronting educational administrators.

52.833 Research and Statistical Methods for School Administrators

A study of the application of the methods of research and statistical techniques in the solution of school system problems. The role of research in the administrative decision-making process will be examined. The course of study may also focus on the various research designs administrators may use in their position, such as the development of an educational program proposal for local, state, or federal agencies. A specific topic of practical significance in school administration will be selected by the student, and a design for the study of the topical problem will be developed. Educational research relevant to the topic will be evaluated. *Recommended prep.*

rudimentary knowledge of research designs and techniques and an elementary knowledge of basic statistical methods.

52.834 Educational Finance

The study of school finance deals with the principles and problems of financing education, and also considers the basic concepts of economics relative to the place of school finance in the field of public finance. The sources and rationale for public support of schools are examined. Selected state and federal aid programs, capital outlay programs, current practices and issues of local support, and bond issue campaigns are included in this study.

52.835 School Business Management

Practices and issues in the administration of school business affairs are the major concern of the course. The role of the school business administrator and the educational budget will be examined. Attention will be paid to principles of budget preparation and development, purchasing, supply management and distribution, school accounting and data processing systems, auditing, financial reporting and management of payroll, transportation programs, school food services, and the operation and maintenance programs for the physical plants. In addition, each student will be placed in a simulated decision-making situation. Background materials have been prepared which describe aspects of a fictitious school system, including its publics, policies, and other relevant information. Each student may have the opportunity to deal with matters typically faced by the school business administrator.

52.836 Personnel Administration

The purposes, patterns, and issues in personnel administration are the major considerations of the course. Study will include the skills, attitudes, and knowledge which an institutional staff needs to have and which are essential to the accomplishments of organizational goals. Personnel administration programs and problems of student personnel, paraprofessional, nonprofessional, and professional staff members will serve as the focus for the course.

52.837 School-Community Relations

This course includes the study and design of school-community relations programs based on the principles and practices of the intercommunications between the school and its several publics. Selected research findings relative to public relations programs in business, industry, and governmental agencies will be reviewed in addition to those involving educational systems. Stress will be placed on the role of the administrator in the development of a comprehensive program of school-community relations for his administrative unit.

52.838 School Plant Planning, Operation, and Maintenance

This course seeks to have the student develop a basic understanding of the processes involved in the planning, maintenance, and operation of school plants. Such items as educational specifications, the process of school construction, techniques used to provide clean, safe, and healthy environments for the teaching-learning process, along with the selection, assignment and supervision of custodial and maintenance staff will be involved. Statutes or regulations pertaining to these processes used by state and local regulatory bodies will also be reviewed.

52.840 Problems in School Administration: A Simulated Experience — The Superintendency

52.842 Problems in School Administration: A Simulated Experience — Assistant Superintendent for Instructional Services

These courses are designed to place students in a simulated decision-making situation in their area of concentration. Background materials have been prepared which describe all aspects of a school system, including its publics, policies, certified and noncertified staff members, and the geographical and socioeconomic makeup of the community. These background data may be disseminated through motion pictures, film strips, and taped interviews with influential people in this community as well as through written materials.

52.843 Administrative Internship

This is an individualized offering involving supervised observations, internships, externships, and seminars in educational administration, and it is designed to provide further practical experience in the student's area of administrative preparation. The administrative internship program must be worked out with the adviser not later than the end of the second week of the quarter preceding the quarter during which the internship will take place.

52.844 School Law

The student will be expected to develop a basic understanding of federal and state laws that apply to school systems, educational programs, and personnel, as well as of the legal prerogatives available to the practicing administrator and the local boards of education. This study will include consideration of the constitutional, statutory, and common-law foundations of educational systems and the school administrator's role with respect to them.

52.850—851—852 Doctoral Seminar in Leadership: Administration and Supervision I, II, III

A series of three seminars required of all students pursuing the Ed.D. degree. The dialogues in these courses will use an interdisciplinary approach to explore complex behavioral and structural interactions found in formal organizations. Major emphasis will be placed upon integrating theoretical concerns with practical administrative functioning.

This sequence of seminars is viewed primarily as a pooling of the results of extensive individual student research and activities and is aimed at giving the student an overview of all aspects of the institution he/she will be leading.

52.854 Organizational Analysis

A course open only to advanced graduate students, this course will include examination of different approaches used to define traits or characteristics of formal organization. Special emphasis will be placed on the application of models, typologies, and schemes to identify structural or procedural deficiencies in bureaucratic social systems. *Prep. Permission of instructor.*

52.860 Academic Administration in Higher Education

Recruitment of properly qualified faculty and staff is only one problem of the academic administrator. This course will also consider the problems of: pupil ser-

vices, admissions, athletics, curriculum development, accreditation, instructional resources, registration and scheduling, faculty organization, continuing education, faculty rights and responsibilities, and personnel policies.

52.861 Problems in College Administration: A Simulated Experience

This seminar is designed to place each student in simulated decision-making situations as an administrator of a college or junior college. Background materials have been prepared which describe many aspects of a college including its policies, makeup of faculty and student body, its financial situation, the community it serves, and its board of control. *Prep. 52.863, Financial Management in Higher Education or permission of instructor.*

52.862 Institutional Planning and Facilities

This course will consider the planning of new colleges as well as the expansion and maintenance of existing ones. Systems analysis, needs surveys, and development of educational specifications for college facilities will constitute half of the course. The other half will involve the operation and maintenance of the physical plant, including provisions for housing, safety, parking, communications, and health service.

52.863 Financial Management in Higher Education

This course seeks to combine a knowledge of fund-raising activities with the study of proper financial management in higher educational institutions. The problems of fund raising for both public and private, two- and four-year institutions will be considered. Modern techniques of budget preparation and control may include purchasing, school accounting, data processing, providing benefits for faculty, financial reporting, food services, housing, and operation and maintenance of physical plant.

52.864 Typologies of Higher Education

A study of the types of higher educational institutions, with emphasis on organizational structure, modes of governance, and administration. The history of higher education, particularly the development of colleges, universities, and junior colleges in the United States, will be considered to provide perspective for the modern college administrator. Important issues and the problems they present for administrators will provide the major focus of this course.

52.865 Systems Theory in Education

This course will provide the student with an introduction to general systems theory and the implication of systems theory to leadership, administration, and supervision. The course will include examination of systems applications such as PERT, PPBS, and flowchart development. Special consideration will be given to systems study as a method of planning and evaluation.

52.866 Politics and Educational Decision Making

This course examines federal, state, and local governmental arrangements and political processes which influence educational policies of school systems. Emphasis is given to the application of political science concepts and research methods to educational policy-making processes and to the political environment surrounding the educational administrator.

52.867 Administration of Adult and Continuing Education

The historical development of adult and part-time education, with attention to the

present status and trends for the future, will be studied, with emphasis on the administration of these programs. A variety of adult educational programs in schools, colleges, junior colleges, religious agencies, social service organizations, business and industry, and professional organizations will be included, focusing on planning, implementing, administering, financing, and evaluating such programs.

52.868 The Community College

Emergence of the community college movement in the United States, administrative structures and governance, the role of faculty in planning, the student population and related student personnel services will be examined. Particular emphasis is placed upon the identification and utilization of community resources in curriculum development and the college's total relationships with the community in which it exists. The two-year technical institute and both publicly and privately supported junior colleges will be studied. Field visits are an integral part of course requirements.

52.869 Problems in Urban School Administration

This course is a study of problems of educational administration in the complex city school system with emphasis on solutions of educational problems caused by the unique demographic characteristics of the city.

52.870 Securing and Administering Grants in Education

This course is designed to provide school administrators with knowledge of fund raising for educational purposes, and supervisory techniques for funded programs. Designed as a systems approach to grantsmanship, the course will emphasize the methods and techniques of fund raising, program planning, and proposal writing.

52.871 Typologies of Experiential Education

This course will begin with the examination of the historical roots of work related education, focusing on such programs as the German continuation schools, the British Admiralty schools, and work experience programs of the last century. The programs introduced later, such as cooperative education, "sandwich courses," "Enseignement en alternance," and study service, will be reviewed for the variety of designs and their applicability to specific target groups. The issues of governance and control of these programs will round out the content. Finally, some discussion of the impact of these programs on current educational administrative practices in work related education will be analyzed.

52.872 Administration of Experiential Education Programs

This course will focus on the planning, organizing, budgeting, implementing, and evaluating of experiential education programs, with particular emphasis on work related programs in a variety of countries. An examination of the development and operation of such programs as cooperative education, cooperative work experience, external degree, sandwich courses, "enseignement en alternance," study service, and other work/school arrangements will lead to discussion of the administrative problems involved. Additional topics may include off-campus learning, administrative involvement in assessment, appropriate supervision techniques, and the development of a rationale for work in the curriculum. *Prep. 52.871 Typologies of Experiential Education.*

52.873 Cooperative Education in America

An examination of cooperative education as a complex tool for achieving goals of education. Attention will be directed to its psychological implications for the individual, its social implications for the nation, and its place in educational thought. American higher education will be the principal focus of these considerations.

52.893 Doctoral Dissertation

Prep. admission to candidacy in the Doctor of Education degree program.

52.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Not available to special students. Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

COUNSELOR EDUCATION

53.800 Philosophical Foundations of Guidance and Human Services

The purpose of this course is to provide a philosophical and theoretical background for beginning graduate students in counseling. The course has three objectives: 1) to sharpen the "self as instrument" through study and discussion of established theories of helping as related to one's personal value system and through self-exploration and increased self-understanding in heretofore unexplored personal areas; 2) to introduce students to the broad spectrum of professional helping service areas with the intent of clarifying the students' professional roles; and 3) to begin to promote the development of a professional identity as a psychological helping professional.

53.801 Tests and Test Procedures

The principles and problems of psychological testing as applied to the work of the counselor are discussed. Some consideration is given to technical concepts as they apply to the treatment, use, understanding, and interpretation of test scores. The student is offered the opportunity to become familiar with some of the currently used tests of intelligence, scholastic aptitude, differential aptitudes, achievement, interest, and personality. Tests are evaluated for use in education and guidance. Problems of test interpretation are emphasized.

53.802 Vocational Development and Occupational Information

A dual-emphasis course dealing, first, with theories about how individuals make decisions concerning their choice of vocation; and second, with the kind of data which is needed to assist people with these decisions. These requisite data deal with the following areas: the relationship of social and economic change to occupational trends; the classification and description of occupational fields; methods of collecting, evaluating, filing, and disseminating vocational information; and the role of the counselor in fulfilling these functions.

53.804 Counseling Theory and Process

A required course for all Counselor Education degree candidates which must be taken in the Fall Quarter concurrently with the beginning of Practicum. The course

will provide the student with a basic cognitive understanding of several major theoretical approaches to counseling. Classroom content will help the student to become familiar with a wide range of individual counseling strategies; to develop listening, understanding, and communications skills; and to further probe his own self-understanding as a counselor. These skills and understandings will be discussed and simulated in the context of a variety of settings with a variety of clients. Role playing, case material, and audio and video materials will be utilized in the instruction. This course will not be open to special students, but may be selected by degree candidates in other departments in any quarter except the fall quarter.

53.805—806 Counseling Practicum I and II

The counseling practicum is a supervised counseling experience extending over the academic year. Although registration for this course occurs only during the Winter and Spring Quarters, students will actually begin their practicum in the Fall Quarter. Emphasis in the fall will be on small-group seminars dealing with counseling and other related matters. The Winter and Spring quarters will concentrate on the supervised counseling assignment. Assignment to practicum settings will be made according to the student's major area of concentration. Students must make themselves available a minimum of two days per week during the academic year (October to June) for placement in a field setting. Seminars will stress material germane to the student's major and will meet a total of 24 times during the year. 53.805 must be successfully completed prior to commencing 53.806. (For administrative purposes, these practicum course numbers will apply to each of the following specific practicum placements: Elementary School Practicum, Secondary School Practicum, College, Mental Health and Rehabilitation Practicums.)

Part-time students must submit an application for practicum (available from the Department) by April 1, for approval to enroll in the practicum the following Fall Quarter. *Prep. 53.800 Philosophical Foundations of Guidance and Human Services (or 56.950 Introduction to Rehabilitation, for Rehabilitation Counseling majors only) and 53.804 Counseling Theory and Process, both of which may be taken concurrently with the beginning of practicum.*

53.807 Administration of Guidance Services

An advanced-level guidance course designed to help meet the certification requirements for guidance directors in Massachusetts. The course will cover philosophies, principles, and methods of establishing and administering guidance programs in the public schools. Simulated materials are used to replicate actual guidance problems dealing with testing programs, budgeting, interpersonal relationships, and other practical matters.

53.808 Group Counseling

An introduction to theory, principles, and techniques of counseling with groups of individuals at different levels of development and for varying purposes. A basic mode of approach may be to involve students in a genuine group counseling experience in order to understand the phenomenon of group experience. *Prep. 53.804 Counseling Theory and Process.*

53.809 The College Student and the Campus

The relationship between college students and their environment will be examined. Focus is on student rights, emotional concerns, and the search for identity. The impact of societal forces and nontraditional patterns of study on student behavior are

stressed. Varying concerns of personnel services in different types of college climates, including the community college, are discussed. Current issues in higher education are examined as they relate to services to students.

53.810 Elementary School Guidance

Required for elementary counseling majors, this course has three principal objectives: 1) to gain a theoretical understanding of the personal, social, academic, and vocational development of children between the ages of 5 and 12 years; 2) to conceptualize the roles, functions, and goals of the elementary school counselor; and 3) to begin to consider a variety of programmatic strategies to operationalize the goals of the elementary school counselor. Topics to be studied include values clarification, decision making, developmental guidance, major theoretical approaches to development, the issue of exceptionality, occupational information and vocational development, and confluent education. These topics are set in the context of the elementary school counselor's role as a counselor/consultant/coordinator for the total elementary school population.

53.811 Family and Parent Counseling

The family will be studied as an institution, as an arena of interpersonal transaction, and as a seedbed of both distress and health. Various modes of counseling families will be presented, together with the theoretical notions underlying their use. The course will also demonstrate counselor-parent relations in the context of the school setting. *Prep. 53.804 Counseling Theory and Process.*

53.812 Seminar in Student Personnel Work

Relevant topics and cases for personnel workers and administrators in higher education will be discussed and studied in depth. Particular emphasis is placed upon the development of student personnel programs, budget planning and development, and staff relationships. The expertise of appropriate specialists is utilized.

53.813 School Counseling Strategies

Intended primarily for students who will counsel in school settings or other settings emphasizing work with children and adolescents. A broad range of approaches will be considered, including, but not limited to, behavior modification and Gestalt and Adlerian strategies. Special emphasis will be placed on the development of strategies designed to help alleviate typical school related and developmental problems such as nonachievement, decision making, negative self-identity, and disruptive behavior. Consideration will also be given to the counselor's role as a consultant to teachers, parents, and administrators in effecting positive behavior change. *Prep. 53.804 Counseling Theory and Process.*

53.814 Vocational Counseling Strategies

A person's role expectations in the world of work will be examined from a human development perspective, and a systematic program is set forth to foster self-awareness. Vocational counseling is viewed as dealing with the entire individual, including his/her values, underlying psychological needs and drives, and the influence of the environment on one's present level of development and career awareness. Other topics to be developed in this course will include counseling with females and nonachievers, the decline of the work ethic, community resource development, job placement, and information giving as a perceptual process. *Prep. 53.804 Counseling Theory and Process. The course is intended for a variety of client populations from adolescence through adulthood.*

53.815 Rehabilitation Counseling Strategies

Primary emphasis will be on the roles and functions of the rehabilitation counselor, relevant issues in the field, and an overview of the rehabilitation process. Special problems and techniques of counseling with the disabled (physical, mental, and behavioral disorders) will be examined through case studies and role playing. Disability in the context of social deviance will be discussed, and psychosocial approaches in understanding human behavior, including self-concept, social role theories, and rational-behavioral approaches, will also be examined. *Prep. 53.804 Counseling Theory and Process (This prerequisite is waived for Rehabilitation Administration majors.)*

53.816 Psychological Counseling Strategies

Focuses on a variety of strategies designed to alleviate problems of older adolescents and adults. Developmental and perceptual-Gestalt insight approaches and behavioral approaches to counseling will be analyzed for their effectiveness with a variety of psychological problems. The context for considering this eclectic approach to psychological counseling will be communications theory and organizational psychology, with the latter being related to the effective delivery of counseling and mental health services. *Prep. 53.804 Counseling Theory and Process. This course is primarily intended for the student working with client populations in mental health settings and college counseling centers.*

53.818 Case Studies in Marriage and Family Counseling

An advanced-level course for students with previous experience or preparation in marriage and family counseling. Skills to be emphasized may include 1) the preparation of case studies of family and marriage histories and current functioning; 2) the design of service, counseling, and referral programs based upon comprehensive studies of needs and resources; and 3) the practice of counseling strategies through role playing, taped interviews, and progress reports of current counseling activities. *Prep. 53.811 Family and Parent Counseling.*

53.820 Seminar in School Psychology

This course provides an intensive analysis of philosophical, technical, and school administrative issues contributing to the professional identity and function of the psychologist in an educational milieu. Simulations, case studies, and research projects will be used to study these issues. *Prep. permission of instructor.*

53.821 Psychoeducational Prescriptions

This course will deal with methods of synthesizing psychological information into effective, individually appropriate educational plans. Specific applications of methods from previous courses will be discussed. *Prep. permission of instructor.*

53.824 Individual Intelligence Testing

(6 quarter hours)

Preparation to administer, score, and interpret the Stanford-Binet Intelligence Test, the Wechsler Adult Intelligence Test, and the Wechsler Intelligence Scale for Children. Consideration will be given to the theories of intelligence upon which the tests are based and the use of the tests in educational and clinic settings. Students will be required to administer and score thirty tests, including some from each of the three tests included in the course. *Prep. 53.801 Tests and Test Procedures.*

53.830 Seminar in Contemporary Issues in Counseling

Intensive study of a selected topic in counseling such as counseling minorities, current research, sex counseling, transactional analysis theory and practice, behavioral counseling. Course objectives will vary according to the topic but may include a review of the literature, skill-building workshop and action projects. *Prep. 53.834, Advanced Theories of Behavior Change and/or permission of instructor.*

53.831 Advanced Group Counseling

This course will be a continuation of the content presented in Group Counseling, placing greater emphasis on developing skill in conducting group counseling at a variety of age levels. Greater attention will be given to relevant readings and research on group process and methods for behavior modification. *Prep. 53.808 Group Counseling.*

53.833 Seminar in Counseling Supervision and In-Service Education

Supervisory methods of improving the effectiveness of school counselors' skills in counseling and other aspects of guidance work, of involving counselors in the improvement of the guidance program, and of enhancing the personal growth of the counselor. *Prep. master's degree in guidance or permission of the instructor.*

53.834 Advanced Theories of Behavior Change

An advanced-level counseling course required of all CAGS students and designed to provide greater depth of cognitive understanding of a variety of approaches to counseling. Original readings from a number of major theorists will be required. A major goal of the course will be to identify the major similarities and differences of assumptions, goals, and strategies of the theorists studied, and to build a strong conceptual basis for a counseling eclecticism from this analysis. Some of the theorists studied may include Freud, Adler, Perls, Ellis, Glasser, Rogers, Sullivan, May, Frankl, Bandura, and Skinner. *Prep. at least two counseling courses emphasizing both theory and process.*

53.835 Psychodiagnostic Measures

An advanced-level course in the clinical assessment of ego functioning of children and adults. The course places heavy emphasis on the case study method. Assessment data may be gathered from a variety of sources—interviewing, observation, objective and projective testing. Some of the tests typically studied in this course may include the Semantic Differential, California Psychological Inventory, Minnesota Multiphasic Personality Inventory, Thematic Apperception Test, Bender Gestalt, Draw-A-Person, Sentence Completion Test and various interest tests. Separate sections may be available for school oriented and clinically oriented students. *Prep. 53.801 Tests and Test Procedures, Abnormal Psychology or Personality Theory, and permission of instructor.*

53.840—841 Advanced Field Work

(8 quarter hours)

Required of all CAGS students. Students may be assigned a field work placement consistent with their major professional goal and/or the setting in which they intend to work. The activity of the field work may extend across the academic year from September to June and require a minimum of one and a half days per week, or the equivalent, in the field work setting. Seminars will meet, subject to change, on alternate weeks with additional individual supervision on campus. Supervision will also be provided in the field setting. Both quarters must be completed before credit will be given for the course. *Prep. Counseling Practicum or the equivalent in experience.*

53.843—844 School Psychology Field Work

(8 quarter hours)

Required of all CAGS School Psychology majors. The student may be assigned a field work placement in a K-12 school system under the supervision of a certified school psychologist. The activity of the field work will extend across the academic year from September until June. The student will be required to put in a minimum of one and a half days (300 hours) in the field work setting during the school year. Seminars will meet regularly on campus with additional university faculty supervision. *Prep. School Psychology Practicum.*

53.891 Thesis

A research activity that may be selected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

53.893 Doctoral Dissertation

Prep. admission to candidacy in the Doctor of Education degree program.

53.895 Institute in Counselor Education

(See general institute description on page 115.)

53.898 Workshop in Counselor Education

(See general workshop description on page 115.)

53.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Not available to special students. Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

SPEECH PATHOLOGY AND AUDIOLOGY

55.803 Cerebral Palsy

Neuromuscular involvements and concomitant language and speech disorders; intellectual deficits, psychological deviations, communicative disorders of a cerebral palsied population; testing, placement, and management of the cerebral palsied child and adult with emphasis on a multidisciplinary approach. *Prep. permission of instructor.*

55.804 Neurological Bases of Communication

This course will provide the student with a basic understanding of neuroanatomy and neurophysiology as it relates to normal aspects of speech, hearing, and language.

55.805 Seminar: Voice Disorders

Physiology and neurology of the laryngeal mechanism; the laryngoscopic examination. Voice disorders as learned behavior as a result of organic, neurological, and psychological deviation. Evaluation, referral, and management. *Prep. permission of instructor.*

55.806 Language Disturbances in Children

This course will emphasize current theories in language behavior and their practical application to the assessment and remediation of language disturbances in children.

Lectures, discussions, and workshops may focus on the following issues: what constitutes a language problem, what assessment tools and teaching techniques are currently available, and what underlying principles are involved in selecting and sequencing the content of a remediation program. *Prep. 55.812 Differential Diagnosis in Speech and Language Pathology, and 55.816 Test Procedures in Speech and Language Pathology or permission of instructor.*

55.811 Clinical Management in Stuttering

This course will emphasize diagnostic techniques, a review of the current therapeutic approaches, consideration of the individual's need in therapy, and the process of behavioral and attitudinal change. Also to be considered are termination, referral, and group therapy. *Prep. permission of instructor.*

55.812 Differential Diagnosis in Speech and Language Pathology

Evaluation, interpretation, and integration of test results; the application of standard psychological tests to speech and hearing disorders; analysis of patients' premorbid and morbid histories, medical and psychological diagnoses; design and execution of therapeutic procedures; proper referral techniques and report writing; practicum situation. *Prep. 55.816 Test Procedures in Speech and Language or permission of instructor.*

55.813 Advanced Clinical Practice

(8 quarter hours)

Supervised clinical practicum in speech pathology and audiology in the Northeastern University Speech and Hearing Clinic and medical settings, educational settings, and rehabilitation centers. A minimum of 150 clock hours of experience with patients to extend over a three-quarter time period is required. An "I" grade will be awarded until all the requirements are met and then a pass-fail grade will be awarded. This course requires attendance at on-campus seminar meetings held twice a month. *Prep. 50 clock hours of clinical experience and permission of the clinical staff.*

55.814 Clinical Audiometry I

The use of pure tone and speech reception instrumentation and hearing aid evaluation; the results and interpretation in the diagnosis of functional and organic disorders. Lectures, demonstration, observations, and practicum. *Prep. Introduction to Audiology and consent of instructor.*

55.815 Clinical Audiology

The process of identification and evaluation of hearing loss. Differential diagnosis. Tests for conductive, sensorineural, and retrocochlear involvements. A consideration of research findings in the area of hearing aid selection, auditory training, lip reading, and language training for hearing-handicapped individuals. *Prep. Introduction to Audiology (see undergraduate Education catalog) and permission of instructor.*

55.816 Test Procedures in Speech and Language Pathology

Procedures in evaluating organic and functional communication disorders using standard and nonstandard speech and language tests in University clinic situations. Demonstration and application of techniques and objective reporting. *Prep. permission of instructor.*

55.818 Pathologies of the Ear

Lectures and observations in the organic and neurological pathologies of the ear; i.e., otitis media, Meniere's disease, and otosclerosis. Consideration of approaches to treatment (medical setting). *Prep. permission of instructor.*

55.819 Clinical Audiometry II

Specialized techniques (Bekey, FGSR, EEG, group testing, and screening); the results and interpretation in the diagnosis of functional and organic hearing disorders. *Prep. Introduction to Audiology and Audiometry I, lectures, demonstration, observations, and practicum; permission of instructor.*

55.820 Physiological Acoustics

Particular emphasis is placed on the biophysics of the hearing mechanism, especially in terms of actual clinical utility. Comparative anatomy and physiological analysis and dissections may accompany many of the class lectures. *Prep. introductory courses in Speech and Hearing, 55.815 Clinical Audiology, and permission of instructor.*

55.821 Seminar in Audiology

Advanced study of the rationale and development of principles associated with special procedures and methods used in audiology. *Prep. permission of instructor.*

55.822 Seminar in Oro-Facial Anomalies

Course material will be presented via lectures, class discussions, and frequent visits to and participation in several plastic surgery clinics. Guest lecturers in the areas of plastic surgery, genetic counseling, and otolaryngology may be invited to participate in the course. Major content areas will be embryology, etiology, cleft lip and palate, and other syndrome classifications; speech and language considerations; surgical, dental, and otologic considerations; psychological and social considerations; and an analysis of the total team habilitative effort. *Prep. Anatomy and Physiology of the Speech Mechanism and permission of instructor.*

55.823 Psychosocial Aspects of Communication Disorders

This course is concerned with the psychological and social aspects of organic and nonorganic communication disorders. It will include personality dynamics in aphasia, cleft palate, cerebral palsy, deafness, and other primarily organic disorders, and psychogenically motivated disorders such as stuttering, language, and articulation. *Prep. permission of instructor.*

55.824 Seminar in Speech Pathology

Individual research and/or critical review of the literature in some area of basic science, speech sound learning, language, voice, fluency, or multiple disorders. Class presentations of material and class discussion may be included. *Prep. open to graduate students who have completed the equivalent of two quarters of graduate work in Speech Pathology and who have permission of the instructor.*

55.860 Aphasia Rehabilitation

Emphasis on current attitudes toward therapy and new methods, clinical methods of evaluation which are preparatory to therapy, and observation of therapeutic methods. *Prep. 55.804 Neurological Bases of Communication and permission of instructor.*

55.861 Neuropathology

The intricacies of neurological disease. Application of functional neuroanatomy in comprehending the various disease processes involving the nervous system. Derangements of speech with a neurological basis; an understanding of the disease process in relation to the diagnosis and treatment of patients with neurological diseases: cerebrovascular disease tumors or malformations, Parkinson's disease, multiple sclerosis, and others. Case presentations, neuroanatomy, laboratory experience, and analysis in the hospital environment. *Prep. permission of instructor.*

55.862 Psychoacoustics

Particular emphasis will be placed on masking, frequency vs. intensity relationships, evoked response procedures, brief tone and temporal integration, binaural summation, impedance foundations, and general behavioral responses to sound stimuli. *Prep. Introduction to Speech and Hearing, 55.815 Clinical Audiology, 55.820 Physiological Acoustics, and permission of instructor.*

55.863 Advanced Study in Articulation Disorders

An exploration into advanced theories of normal and abnormal phonological development with emphasis on distinctive feature theory and phoneme theory; direct application of theories to diagnosis and treatment of various phonological disorders. *Prep. undergraduate course in articulation disorders and permission of instructor.*

55.864 Parent Education in Communication Disorders

This course is designed to develop the student's understanding of the role of the parent in the therapeutic process. Content of the course includes various approaches to parent education, including group therapy, client-centered counseling, and filial therapy. *Prep. 55.823 Psychosocial Aspects of Communication Disorders and permission of instructor.*

55.865 Seminar: Speech Science

Major topics may include the physics of sound generation and modification via the vocal tract, the biophysiology of respiration for phonatory processes, electromyographic techniques and biopotential recording systems, laryngeal and articulatory function, coupling, nasality, and X-ray procedures (head plate analysis). Neural innervation and vascular supply may be considered in conjunction with each muscle discussed. *Prep. course in speech science, and permission of instructor.*

55.866 Hearing Science Seminar

Individual research and/or critical review of the literature in the areas of bone conduction of auditory signals, evoked response and audiometry, impedance and audiometry, cortical processing of auditory input, and other related topics. Students will be responsible for class presentations of researched material. *Prep. permission of instructor.*

55.871 Medical Perspective to Anatomical Correlates in Audiology

This course provides the student with the opportunity for hands-on experience with dissection of human temporal bones as an approach to learning temporal bone anatomy. Students may become familiar with dissection techniques, use of dissecting microscope, and may have an opportunity to observe actual surgical procedures in a hospital. *Prep. permission of department chairperson.*

55.872 Medical Perspective to Anatomical Correlates in Speech Pathology

This course will provide the opportunity for hands-on experience with dissection of human larynxes as an approach to learning voice tract anatomy. Students may become familiar with dissection techniques, use of dissecting microscope, and may have an opportunity to observe actual surgical procedures in a hospital. *Prep. permission of department chairperson.*

55.873 Social Dialectology: Theoretical, Educational and Clinical Considerations

This course focuses on the social and cultural influences on the language behaviors and communication needs of the culturally "different" child. It emphasizes the interrelationship between linguistic structure and social structure and its implications for clinical intervention. *Prep. permission of instructor.*

55.874 Behavior Modification: Operant Procedures in Speech and Language Training

This course reviews principles and procedures of the functional analysis of behavior, and focuses upon the application of behavioral theory and research to speech, language, and hearing training. It emphasizes clinical investigation in the experimental analysis of behavior of communication disorders and experiences in the application of experimental procedures in assessment and treatment programs. *Prep. permission of instructor.*

55.891 Thesis

A research activity that may be selected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

55.895 Institute in Speech Pathology and Audiology

(See general institute description on page 115.)

55.898 Workshop in Speech Pathology and Audiology

(See general workshop description on page 115.)

55.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Not available to special students. Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

*Education of the Hearing Impaired***55.825 Teaching Speech to Deaf Children**

Utilization of vibration, visual aids, kinesthetic and proprioceptive cues, residual hearing and imitation in combination, to elicit intelligible speech from the deaf.

55.826 Teaching Reading to the Deaf

Modern methods in use, such as the Fitzgerald Key and the Natural Language Approach. Emphasis on how to use language in natural situations through lip reading and writing, with later emphasis on the formal presentation of language principles.

Methods used to develop reading experiences that focus on content rather than mechanics. Development of a balanced reading program that will provide adequate

motivation, provision for evaluation, a wide variety of rich materials, and a well-organized sequence of reading experiences.

55.827 Methods and Materials in Deaf Education

Special methodologies in teaching the deaf. A wide view of the field and a comprehensive consideration of methods and materials. Emphasis placed on how to provide concrete experiences and activities, trips, and demonstrations to assist the child in understanding. There may also be demonstrations in the use of visual and auditory aids.

55.828 Aural Rehabilitation

Various speechreading methods, auditory training techniques, and materials. An integrated approach to the treatment of the hearing handicapped.

55.829 Foundations of Deaf Education

This course will provide the student with an analysis of historical and current trends influencing educational programming for the hearing impaired. The deaf learner will be considered an individual with a unique learning style, thus necessitating an appropriate educational setting. Educational services, resources, placements, and the importance of differential diagnosis will be stressed.

55.852 Student Teaching of the Hearing Impaired (8 quarter hours)

An opportunity for observing and teaching deaf children at various levels, under regular supervision in the Boston School for the Deaf in Randolph, Massachusetts.

55.867 Intermediate Sign Language

This course in manual communication develops the basic vocabulary learned in the introductory course into conversation fluency. The course nurtures individuals' abilities to communicate with deaf persons. *Prep. a course in basic sign language.*

55.868 Advanced Sign Language

This course provides an introduction to the meta- and paralanguage areas of manual communication and provides focus on the more esoteric ideographic signs reflecting usage differences among geographic regional dialects. It provides information on the difficulties in communicating with the more severely language retarded deaf individuals. *Prep. 55.867 Intermediate Sign Language.*

55.869 Teaching Language to the Deaf

This course presents skills for utilizing various methods of teaching language to deaf children. Methodologies are generated from analyses of language acquisition models. Emphasis is placed on the individuality of language intervention best suited to a particular learning style.

REHABILITATION ADMINISTRATION AND SPECIAL EDUCATION

Rehabilitation Administration

56.950 Introduction to Rehabilitation

An overview of and orientation to the field of rehabilitation, including its historical development, legislative involvement, psychological implications, and sociological dimensions. Emphasis is placed on coordinating and integrating services as they relate to the field of rehabilitation as a community process.

56.951 Principles of Medical Rehabilitation

The wide spectrum of disabilities that could profit from rehabilitation, including orthopedic, neurological, medical, surgical, and mental disabilities. Basic principles of medical rehabilitation important for the administrator to know may be presented. Psychological aspects of disability also discussed.

56.952 Rehabilitation and Social Services

This course deals with the use of the rehabilitation model in program development for the physically handicapped, mentally retarded, emotionally disturbed, aging, welfare populations, youthful offenders, culturally disadvantaged, and other special community programs. Emphasizes the administrative involvement in developing and supporting the diagnostic, evaluative, counseling, and placement procedures used in such rehabilitative programs. Issues involving clinical program planning may be explored.

56.953 Organization and Administrative Theory

The body of conceptual knowledge regarding organizational and administrative theory will be examined. Formal and informal organizations, organizations as social systems, status and role concepts, leadership in organizations, power structure, relationships to authority, decision making, and communication in and between organizations. An organizational analysis will be made of all the different types of rehabilitation settings currently in use.

56.956 Community Planning in Rehabilitation

What the administrator needs to know about community planning to plan a program in his area. Basic principles of community planning, community organization, and community dynamics, as well as interdisciplinary relations in rehabilitation. Examples of community planning from different rehabilitation agencies and the referral process among these agencies will be studied.

56.957 Federal-State Relations in Rehabilitation

The complex network of federal-state relations and their implications for rehabilitation. Grant procedures, matching formulas, public relations and RSA directives, state and federal legislation pertinent to rehabilitation.

56.958 Social Welfare and Rehabilitation

This course attempts to acquaint administrators, counselors, and other human services personnel with the broad field of social welfare. The course reviews the historical backgrounds of the relationship between vocational rehabilitation and social welfare and the more recent fast-moving developments in the relationship of these fields.

56.959 Rehabilitation Research and Evaluation

The emphasis in this course will be on administrative research, program evaluation, grantsmanship, etc. In addition, students will have the opportunity to develop a research design on some aspect of rehabilitation administration and carry out the necessary research operations involved.

56.960 Practicum in Rehabilitation Administration

(8 quarter hours)

Students are usually assigned to a variety of rehabilitation agencies for their practicum experience. Problem solving relevant to experiences encountered in in-

ternship. A seminar may be regularly conducted by a senior faculty member in conjunction with the practicum experience. This seminar enables students to share their field work experiences and resolve problems in rehabilitation administration which are connected with their field placements. (Students are expected to be available one-half day in the Fall Quarter and two days in the Winter, Spring, and Summer Quarters.)

56.961 Fiscal Management I

An introduction to the notion of fiscal and managerial control. Areas to be covered may include accounting and budgetary procedures, need surveys, goal-setting practices, recruitment, staffing, training, professional development, caseload management, program planning, utilization of research, leadership patterns, performance appraisal, and external relationships. Case method approach may be used in classroom exercises.

56.962 Administration of a Sheltered Workshop

Special problems of administering a sheltered workshop, such as community planning, work evaluation, job training, labor relations, contracting, production, and occupational placement.

56.963 Fiscal Management II

Understanding the fiscal management of the typical rehabilitation setting, including basic rehabilitation agency accounting, planned program budgeting, disbursements, cost analysis, contracting, taxation, forecasting, and funding. The implication of data processing for fiscal management is covered in the course. Special problems will be assigned during the course.

56.964 Legal Aspects of Rehabilitation and Special Education

This course is designed to sensitize rehabilitation administrators, special educators, rehabilitation counselors, and other personnel to the impact of legislative developments upon the field of rehabilitation and special education. Special emphasis is placed on understanding the legal implications for rehabilitation of the latest Vocational Rehabilitation Administrative Amendments, workmen's compensation laws, eligibility determination criteria, and Social Security Amendments. Latest federal and state special education legislation is covered.

56.965 Occupational Placement

A study of the dynamics of moving the rehabilitation client into the world of work within the framework of the specific community structure. Development of facility in use of resource materials in occupational information, job description and analysis, performance appraisal, training, and vocational assessment. The personnel point of view toward the handicapped is discussed and analyzed, and more effective placement practices developed.

56.980 Psychological Problems of Disability

An advanced course in psychopathology as it relates to impact of disability on personality. In-depth study of the moderately and severely handicapped, from the viewpoint of psychosocial factors, interpersonal relationships, and cognitive versus non-cognitive functioning in those with motor and sensory disabilities; problems of dependency and motivation; role of psychosomatic factors. Some discussion of the role of treatment and rehabilitation.

56.981 Administrative Problems in Rehabilitation

Seminar designed to analyze, in depth, critical issues and selected rehabilitation problems. Operations and systems research as applied to rehabilitation will be highlighted. Students are offered the use of institute research studies and studies available through Social and Rehabilitation Services, completed research, and demonstration projects.

56.982 Essentials of Case Management and Supervision

The relationship between case management and casework supervision. Topics are the dynamics of the communication process, decision making, conflict, resolution and compliance, management of resources external to the organization, and structural and functional analysis of supervisory process. Management of case load.

56.983 Rehabilitation of the Alcoholic and Drug Dependent

A study of comprehensive factors, including the nature of etiology dynamics involved in alcoholic and drug dependency; techniques for evaluation; rehabilitation administration, planning, and treatment.

56.984 Rehabilitation of the Penal Offender

The rehabilitation of the penal offender is examined from an eclectic point of view. Psychodynamic elements stressed, as well as social factors in the etiology, evaluation, treatment and rehabilitation seminar planning and administration.

56.985 Rehabilitation of the Geriatric

This course presents a comprehensive treatment of the problems, dimensions, and parameters involved in the administration of the various services and facilities for the rehabilitation of the geriatric. Special emphasis on the rehabilitation philosophy versus disengagement.

56.986 Critical Issues in Rehabilitation Administration

This course is built around the exploration and in-depth discussion of current issues which are highly problematical to the field. Among these issues are the breadth of the concept of disability, appropriate training sequences for the various rehabilitation disciplines, the resolution of conflict over role overlap among disciplines, appropriate models for service delivery systems, etc. The most current and relevant research may be brought to bear upon these areas, as well as knowledge from the reservoir of experience of instructors, visiting experts, and the student participants themselves. Students exposed to the issues as they exist in the profession and in the community. A theoretical orientation frame of reference will be brought to bear upon problems when feasible.

56.991 Thesis

A research activity that may be selected by the student in lieu of two selectives (8 quarter hours), with the approval and recommendation of the adviser.

56.993 Doctoral Dissertation

Prep. admission to candidacy in the Doctor of Education degree program.

56.995 Institute in Rehabilitation Administration

(See general institute description on page 115.)

56.998 Workshop in Rehabilitation Administration

(See general workshop description on page 115.)

56.999 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Not available to special students. Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

Special Education

(For sequence requirements refer to Fields of Study)

56.801 Alternatives for Mainstreaming Individuals with Special Needs

This course is for administrators, teachers, and specialists who are involved with mainstreaming individuals with special needs. Alternatives in decision making and program development, implementation, and evaluation may be explored with members of various disciplines who provide services for special needs children.

56.807 Educating Individuals with Learning Disorders

This course surveys behavioral characteristics of individuals who present specific deficits in perceptual, integrative, or expressive processes which impair learning efficiency. Discussion of diagnostic techniques, curriculum materials, learning style and teaching methods will be combined with observation. Students will be expected to work with a learning disordered individual.

56.808 Review of Current Methodology and Research in Learning Disorders

This advanced course is designed to help develop the following competencies in relation to educating learning disordered individuals (early childhood through adulthood): use of task analysis and learning style to develop comprehensive individual education plans (refinement of skills developed in 56.807); use of current research to evaluate techniques of intervention (e.g., behavior modification and drug therapy for hyperactive children); review of current research to evaluate assessment techniques (e.g., effectiveness of available tests for learning disorders; ability to administer, score, and interpret tests useful in identifying learning disabilities; use of prescriptive techniques and materials for learning disabilities). Selection of topics within competency areas may be individualized for students, based on previous course work and experience. *Prep. 56.807 Educating Individuals with Learning Disorders and 50.815 Research Design in Education*

56.809 Development and Implementation of Programs for Learning Disorders

This advanced course helps to develop required skills for resource room and diagnostic-prescriptive teachers and special needs consultants to the regular classroom. Projects for the course include some of the following: needs assessment for various special needs programs; development of a screening and diagnostic test battery; development of a diagnostic-prescriptive procedure for a specific population; development of in-service programs; development of a plan for educational group management. Projects may be selected by students according to their particular needs. Students in this course should be experienced in working with in-

dividuals with special needs. *Prep. 56.807 Educating Individuals with Learning Disorders and 56.846-847 Special Needs: Diagnostic-Prescriptive Teaching I & II.*

56.831 Education of Individuals with Behavior Disorders

A study of approaches used to deal with behavioral disorders. Emphasis will be on classroom management techniques, use of consultation, and parent-teacher interaction.

56.832 Group Dynamics

Emphasis on understanding group growth, behavior, and action fundamental to developing solutions to the complex problems of group life. Students are given the opportunity to learn to examine their strengths and weaknesses, to examine group leadership styles, to become alert to new ideas and actions, to discover the pulse of a group, and to analyze reasons for one group being productive and another group being unproductive.

56.833 Mental Health

Study of conditions leading to optimal social adjustment. Consideration of the relationship between the maturation process and mental health, possible predeterminants of maladjustment, and factors which encourage the attainment of emotional maturity. Special emphasis is on the role of the school. Contributions from the fields of psychiatry, psychology, sociology, physiology, and medicine may be synthesized and evaluated.

56.834 Case Conferences: Individuals with Special Needs

This course is conducted as a seminar in connection with the student's practicum. Case presentations by outstanding resource persons are thoroughly examined and discussed. Students will also be expected to make their case presentations to the seminar. *Prep. 50.807 Abnormal Psychology, 56.831 Education of Individuals with Behavior Disorders.*

56.835 Socio- and Psychodynamics of Family Life

Consideration is given to the internal and external dynamics of family life and the significance of such dynamics to the mental health of the handicapped individual and family. Emphasis is on the impact of disability on family functioning and integration. Approaches to working with parents of special needs groups may be explored from psychodynamic, social learning and systems view points.

56.837 Seminar: Problems of the Behaviorally Disordered

This course provides an intensive study of the special problems of the behaviorally disordered child. It gives the opportunity to proceed in depth in areas of special interest to the seminar students. Special attention focuses on problems presented by the autistic child, the neurotic child, the child with character disorders, the child with psychosomatic disorders, and the multihandicapped child. *Prep. 56.880-881 Etiology and Development of Special Needs.*

56.838 Development and Implementation of Programs for the Severely Handicapped

Course work includes observation of severely handicapped children in the classroom, demonstration of evaluation and assessment techniques, and development of educational plans for a severely handicapped child. *Prep. 56.840 Psychology*

of Individuals with Special Needs, 56.846-847 Special Needs: Diagnostic-Prescriptive Teaching I & II, 56.839 The Severely Handicapped, or permission of the instructor.

56.839 The Severely Handicapped

A review of handicapping conditions and consideration of the implications of severe multiple handicaps. Students will develop a case study of a severely handicapped person in conjunction with a review of relevant literature. *Prep. either 56.880 Etiology and Development of Special Needs or 56.840 Psychology of Individuals with Special Needs, or permission of the instructor.*

56.840 Psychology of Individuals with Special Needs

A study of the social and emotional adjustment of the handicapped and of the psychological significance of mental, sensory, and motor variations. The effects of limitations imposed by attitudes of society, the attitude of individuals toward their handicap, and the effect of the handicap itself are evaluated. Implications for educational programs are analyzed. (This course should be among the first taken in the Special Education sequence.)

56.843 Evaluation and Education of the Vocationally Handicapped

Designed to develop fundamental skills in the evaluation and teaching of activities related to the vocational development of disabled individuals. Work sample and other techniques are used to assess levels of skills. Focus is on activities such as home management, use of tools, household repairs, basic sewing, essentials of food preparation, and activities of daily living (ADL). Visits may be made to sheltered workshops and vocational adjustment centers.

56.845 Rehabilitation and the Special Education Teacher

This course is designed to deal with effective working relationships between rehabilitation professionals and special education teachers. Elementary and secondary school personnel concerned with children with special needs will also find the course pertinent. Consideration is given to current legislation (Massachusetts Chapter 766) and its implementation, the teacher's role in rehabilitation, and understanding of the total rehabilitation process, and rehabilitation resources available to school personnel.

56.846 Special Needs: Diagnostic-Prescriptive Teaching I

Students will be given the opportunity to develop competencies in observation, recording, and analysis of children's behavior and learning environments including continuous measurement and informal assessment of mild and moderate special needs. Students will be expected to master strategies of applied behavior analysis including precision teaching and contingency management.

56.847 Special Needs: Diagnostic-Prescriptive Teaching II

Students will be given the opportunity to develop competencies in formal assessment techniques and in related instructional materials and methods in language arts, mathematics, and perceptual-motor skills. Students will be expected to work with individuals having mild to moderate special needs to develop the skills outlined above. *Prep. 56.807 Educating Individuals with Learning Disorders and 56.846 Special Needs: Diagnostic-Prescriptive Teaching I, or permission of instructor.*

56.848 Early Childhood Learning Problems — Identification and Program Development

Informal and formal screening and assessment procedures suitable for an early childhood population are evaluated. Students will be required to work with young children in order to acquire experience with screening and assessment techniques. The resulting information may then be used to develop programs to meet the needs of individual children. *Prep. 56.846 Special Needs: Diagnostic-Prescriptive Teaching I.*

56.849 Special Education for Gifted Children

Identification, characteristics, and problems of gifted, creative, and talented children and youth. Emphasis on administrative and instructional adjustments needed to provide for this group of exceptional children.

56.850 Field Work and Seminar with Special Needs Children**56.851 Student Teaching and Seminar with Special Needs Children**

(4 quarter hours each)

Courses designed to satisfy present Massachusetts requirements for teaching children with special needs.

The courses are scheduled to extend over a full year in a series of experiences as observer, tutor, and teacher. Students must make available approximately 250 hours or two days per week for two quarters for field work, then approximately another 250 hours or four days per week for one quarter for student teaching. Students who are employed and who cannot devote full days to satisfy these requirements must arrange to be available evenings, weekends, and summers. Provision for attendance at biweekly seminars must also be made. Seminars are for the purpose of discussing with other students and professors issues in teaching special needs children, which arise in the field. Outside speakers and programs may be arranged to extend this dialogue.

Students who are certified, have a Letter of Approval, or are eligible for the latter from the Massachusetts State Department of Education as a Special Needs teacher may not be required to student teach. Student teaching in another area of special needs or an appropriate elective course may be substituted with the written approval of the student's academic adviser.

Approval of the academic adviser, in writing, will be required before the student can do field placement or student teaching. Approval, in writing, of the academic adviser will be required prior to obtaining a waiver of student teaching.

All students, regardless of past experience, certifications, or letters of approval, are expected to do approximately 250 hours of field work set up and supervised by the University.

56.853 Field Work and Seminar**56.854 Practicum in Special Education**

(4 quarter hours each)

Courses designed to satisfy Department requirements for field experience and extended practicum for SECP or other students who do not need certification. The courses extend over a full year and cover a series of experiences. Students must make available a minimum of two days per week for the first two quarters and five full days per week for the third quarter. Application for field placement is made two quarters prior to that for which field work is planned. Part-time students who are

employed will need to make provision for evening, weekend, or summer assignments to satisfy the requirement for field experience, and a full quarter of field work, five days per week. Provision for attendance at seminars must also be made.

56.870 Administration and Supervision of Special Education

Designed for advanced graduate students preparing for administrative or supervisory positions in special education programs. Facilities and curriculum adjustments, staff roles, methods and content for in-service training, and the use of the team approach are studied. Field trips to observe and evaluate programs are required.

56.880-881 Etiology and Development of Special Needs (8 quarter hours)

The first quarter (56.880) concentrates on factors which primarily affect deviations in cognitive, motoric, and physical development. Understanding of these factors will be used to discuss multidisciplinary life-management issues relating to Down's Syndrome, cerebral palsy, and other common conditions.

The second quarter (56.881) concentrates on factors which primarily affect emotional development. Psychobiological, psychodynamic, and learning theory approaches may be discussed and related to problems of life-span management. Community programs analyzed in addition to the more traditional intervention techniques.

56.882 Seminar in Mental Retardation

A study of research in the field and its implications for teaching. Intervention strategies are studied and evaluated.

56.883 Seminar: Neuropsychology of Learning and Behavior Disorders

Through critical review of the literature, varied neuropsychological interpretations of the nature of learning and behavior disorders are analyzed and discussed. Topics related to the function of the brain and its relationship to behavior include biochemical and physiological correlates, cognitive and perceptual factors, genetic and maturational variables, hemispheric specialization, and implications of drug studies. Implications of the above for the education and servicing of special needs individuals are useful to administrators, teachers, counselors, reading specialists, school psychologists, and those in allied health fields. Students will be expected to give a presentation in an area of interest related to the seminar topic. *Prep. 56.807 Education of Children with Learning Disorders; 56.880, Etiology and Development of Special Needs; 55.806 Language Disturbances in Children, and/or permission of instructor.*

56.891 Thesis

A research activity that may be selected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

56.893 Doctoral Dissertation

Prep. admission to candidacy in the Doctor of Education degree program.

56.895 Institute in Special Education

(See general institute description on page 115.)

56.898 Workshop in Special Education

(See general workshop description on page 115.)

56.899 Directed Study

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Not available to special students. Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

INSTITUTES

50.895, 51.895, 51.896, 52.895, 53.895, 55.895, 56.895, 56.995

A department may offer a special institute in a specific field of interest from time to time. The institute may be a collaborative one offered by the several departments in the College of Education and usually include a special institute faculty drawn from resources outside the University, as well as from the College of Education faculty. The institute focuses on a specific area of academic study and may be interdisciplinary in nature; it involves total time commitments on the part of participants in morning, afternoon, and evening sessions five or six days per week for one to eight weeks, depending upon the nature and scope of the institute. Institutes are customarily designed for participants who are currently employed in a common field of work and are desirous of receiving additional preparation in new methods, new materials, and new content areas. Graduate credit will be granted for successful completion of an institute but may not be applied toward a degree program at the University without the approval of the department in which the student is doing his major field of specialization degree work. All institute participants must be degree candidates in the Graduate School of Education or must qualify, prior to registration, as special graduate students. *Prep. permission of institute instructor.*

WORKSHOPS

50.898, 51.897, 51.898, 52.898, 53.898, 55.898, 56.898, 56.998

A department may offer a special workshop in a specific field of interest from time to time. Emphasis in the workshop is focused on development of instructional materials or resolution of practical problems within a single school or institutional setting, or for a group of potential workshop participants who are currently employed in a common field of work. Graduate credit will be granted for successful completion of a workshop but may not be applied toward a degree program at the University without the approval of the department in which the student is doing his major field of specialization degree work. All workshop participants must be degree candidates in the Graduate School of Education or must qualify, prior to registration, as special graduate students. *Prep. permission of workshop instructor.*

INTERDEPARTMENTAL COURSES

93.801 Seminar in Early Childhood Education Theory and Practice

The seminar will provide students with the opportunity to focus on issues not specifically covered in other course work. Consideration will include such topics as: health and nutrition, diagnosis of childhood diseases, classroom organization and management, referral of children with special problems, licensing, financing, and the like. Emphasis on all these topics is relative to early childhood education and settings. Specialists on the various topics may assist in seminar teaching.

93.802-803 Practicum in Early Childhood Education I and II (8 quarter hours)

The early childhood practicum is a supervised teaching experience extending over three consecutive quarters, although students may register for this for only two quarters. To fulfill the requirement, students must meet in practicum seminars for a total of twenty-four times during the placement. Assignment to practicum settings will be made through the Director of Field Placement in association with the practicum adviser. Practicum placements are made in accordance with students' backgrounds, experience, and progress in the program.

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Curriculum and Instruction	227 CU	437-3302
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Foundations of Education	306 CU	437-3282
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Northeastern University 1978-80

Graduate School of Arts and Sciences



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Academic and Service Buildings

African-American Institute	13	AF
Barietta Natatorium	G6	BN
Bololph Building	G10	BT
Cabot Physical Education Center	G6	CB
Cannery Hall	C6	CA
Churchill Hall	H6	CH
Cushing Hall	B6	CU
Dana Research Center	B5	DA
Dockess Hall	G5	DK
Ellis Library	G9	DG
Ellis Student Center (Auditorium section)	G8	EL
Ellis Student Center (Student Lounge section)	H8	SC
Forsyth Building	H6	FR
Forsyth Building Annex	H5	FA
Greenleaf Building	G4	GR
Hayden Hall	G7	HA
Hillel House	G1	HL
Hurtig Hall	H11	HT
Kerr Hall (Faculty Center)	B6	KH
Knowles Center	F5	KG
Knowles Center (Gryzmarsh Hall)	F5	KV
Knowles Center (Volpe Hall)	J3	UN
11 Leon Street	J3	UN
15 Leon Street	J3	UN
Mugar Life Sciences Building (Peabody Health Professions Center)	G9	MU
Parker Building	G3	PA
Peabody Center	G9	PC
Richards Hall	F7	RI
Robinson Hall	H10	RB
Stearns Center	F4	ST
United Realty Building	H5	UR
Residence Facilities		
Boston YMCA	F10	BY
115 Hemenway Street	A8	15
119 Hemenway Street	A7	19
153 Hemenway Street	B7	53
157 Hemenway Street	B6	57
163 Hemenway Street	C6	63
Kerr Hall	B6	KH
Light Hall	D10	LH
Melvin Hall	B7	MH
Rubenstein Hall	F1	RU
106-122 St. Stephen Street	E8	SS
Smith Hall	B8	SH
Speare Hall	E7	SP
Stetson Hall East	C7	SE
Stetson Hall West	D7	SW
White Hall	E5	WH

NORTHEASTERN UNIVERSITY
BOSTON, MASSACHUSETTS

SCALE 0 100 200

STREET DIRECTION

PARKING

UNDERGROUND TUNNELS

ACADEMIC CALENDAR 1978—1979

Fall Quarter 1978

Registration period		
Burlington	Tuesday—Wednesday	Sept. 12—13
Boston	Monday—Thursday	Sept. 18—21
Classes begin	Monday	Sept. 25
Last day to drop a course	Wednesday	Nov. 22
Examination period	Monday—Saturday	Dec. 11—16

Winter Quarter 1978—79

Registration period		
Burlington	Tuesday	Nov. 28
Boston	Monday—Thursday	Dec. 4—7
Classes begin	Tuesday	Jan. 2
Last day to drop a course	Friday	Mar. 2
Examination period	Monday—Saturday	Mar. 19—24

Spring Quarter 1979

Registration period		
Burlington	Tuesday	Mar. 6
Boston	Monday—Thursday	Mar. 12—15
Classes begin	Monday	Apr. 2
Last day to file card for Spring Commencement	Friday	Mar. 30
Last day to pay fee for Spring Commencement	Tuesday	May 1
Last day to drop a course	Friday	June 1
Examination period	Monday—Saturday	June 11—16
Spring Commencement	Sunday	June 17

Summer Quarter 1979

Registration period		
Burlington	Monday—Tuesday	June 11—12
Boston	Wednesday—Thursday	June 13—14
Classes begin	Monday	June 25
Last day to file card for Fall Commencement	Friday	July 6
Last day to pay fee for Fall Commencement	Wednesday	Aug. 1
Examination period	Wednesday—Thursday	Aug. 1—2

UNIVERSITY HOLIDAYS 1978—79

Columbus Day	Monday	October 9
Veterans Day	Saturday	November 11
Thanksgiving Recess	Thursday—Saturday	November 23—25
Christmas Vacation	Monday—Monday	Dec. 18—Jan. 1
Martin Luther King Day	Monday	January 15
Washington's Birthday	Monday	February 19
Patriot's Day	Monday	April 16
Memorial Day	Monday	May 28
Independence Day	Wednesday	July 4
Labor Day	Monday	September 3

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer and/or the Title IX coordinator.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. Radio stations WBZ, WEEI, WHDH, WJDA, WCOP, WRKO, WLYN, WKOX, WHAV, and WLLH will announce the University's decision to close.

In addition, the University maintains an emergency snow phone (262-SNOW). Whenever in doubt, call 262-SNOW and a taped message will indicate the status of classes.

The Northeastern University catalog contains *current information* regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

We at Northeastern will do our best to make available to you the finest education we can provide, the most stimulating atmosphere in which to learn, and the most congenial conditions under which you may enjoy the learning experience. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. You will be a full participant in an educational partnership. We will and, indeed, can only make the opportunities available to you; it is up to you to take advantage of them.

This is equally true with your career upon graduation. We cannot guarantee that you will obtain any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state. While we will be ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because we cannot know what your expectations and understandings are unless you tell us.

In brief, what we are saying to you is that we are here to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

RICHARDS HALL



the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's day Bachelor of Engineering Technology Programs (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses—offered by the University since 1906—and adult-day courses leading to the bachelor's degree. In addition to its day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed:

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, Certificate of Advanced Graduate Study in the Program of Advanced Literary Study, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science, with specialization in Physical Education and Recreation Education.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education, Doctor of Education, and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer, Doctor of Philosophy, and Doctor of Engineering in Chemical Engineering.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 50 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and three divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, and Mathematics and Psychology, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center of Management Development at Andover, Massachusetts, and the Marine Science Institute at Nahant.

The library collections number 412,000 volumes supplemented by some 333,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 4,000 periodical titles, 100,000 documents, and 10,000 sound recordings.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is located about 20 miles northeast of Boston. Many of the courses at the Institute are applicable toward an advanced degree in biology or health science.

Government Center Campus

With the cooperation of the Federal Executive Board, the Department of Political Science offers an entire Master of Public Administration Program at the John F. Kennedy Building in downtown Boston. This program is primarily for individuals employed in federal, state, or local civil services.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is located 12 miles from the main campus.

the graduate school of arts and sciences

Thirty-eight years ago the Department of Chemistry and the Department of Physics inaugurated the first graduate programs at Northeastern. In the succeeding years the creation of degree programs in other departments of the College of Liberal Arts led to the formation of the graduate program of arts and sciences in 1958 and finally the Graduate School of Arts and Sciences in 1963. Ten departments now offer work at the graduate level.

The Master of Arts degree may be earned in economics, English, history, political science, psychology, sociology, and social anthropology. The Master of Science degree is available in biology, chemistry, economic policy and planning, mathematics, and physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the Certificate of Advanced Graduate Study in the Program of Advanced Literary Study, and the Doctor of Philosophy degree in biology, chemistry, economics, mathematics, physics, psychology, and sociology.

GENERAL REGULATIONS

The general regulations of the graduate school that follow are minimal requirements shared by the several degree programs. The student is advised to consult the appropriate departmental section for a statement of specific requirements. Departments have final authority in specifying degree requirements.

Application

All applicants should address inquiries to the Graduate School of Arts and Sciences. Initial correspondence directed elsewhere may result in valuable time lost in initiating the admissions procedure. Application forms and reference blanks will be mailed to the applicant. This material, together with complete official transcripts, the Graduate Record Examination scores and Miller Analogies Test scores when required, and the results of the Test of English as a Foreign Language, required of all applicants whose native language is not English, should be returned to the Graduate School of Arts and Sciences. Students interested in Forensic or Clinical Chemistry must apply to the Graduate School of Pharmacy and Allied Health Professions. Applications for those desiring assistantships should be submitted no later than March 15; however, some departments have earlier deadlines. Applications received after this date may not be given equal consideration. All necessary supporting documents must be on file with the graduate school office at least four weeks before the date of registration for the

quarter in which the student expects to begin a scholastic program. Foreign students are required to have a Declaration and Certification of Finances Form, as well as the Test of English as a Foreign Language, on file with the Graduate School office at least ten weeks before the date of registration for the quarter in which the student expects to begin a scholastic program. For more detailed information see departmental requirements for admission.

All applicants to the graduate school are strongly urged to take both the aptitude and advanced portions of the Graduate Record Examination. These tests are presently required in biology, English, history, mathematics, psychology, and sociology and anthropology. At least two letters of recommendation are required of all candidates. In biology, physics, psychology, and sociology and anthropology, three letters are necessary. Candidates for financial awards should so indicate to those supplying references.

Applications for the Graduate Record Examination can be obtained by writing to:

Educational Testing Service
Box 955
Princeton, New Jersey 08540

Applications for the Test of English as a Foreign Language can be obtained by writing to:

Educational Testing Service
Box 899
Princeton, New Jersey 08540

Admission

To be enrolled for graduate work, an applicant must submit a complete official transcript indicating the award of a bachelor's degree from a recognized institution and provide evidence of being able to pursue creditably a program of graduate study in the chosen field. Admission to the graduate school is for a specific academic quarter. Acceptance to the school is granted upon recommendation of the departmental graduate committee after a review of the completed application. Foreign students are required to have a Declaration and Certification of Finances Form on file with the Graduate School office. A visa may not be granted without such certification.

Student Classifications

Regular Student Those students admitted with a bachelor's degree showing a high quality of previous work.

Provisional Student Students whose records do not qualify them for enrollment as regular students. Provisional students must obtain a B average in the first 12 quarter hours of study to qualify for enrollment in further courses.

Special Student Students not matriculated in a degree program. Acceptance as a special student is in no way related to admission into a departmental degree program. However, those special students subsequently admitted into a degree program may apply the first twelve quarter hours of credit earned as a special student toward degree requirements. Special students are expected to maintain a B average in the first 12 quarter hours of study.

Doctoral Student Students admitted to a doctoral program.

Doctoral Degree Candidate Doctoral students who have completed 40 quarter hours of acceptable graduate work and have passed the qualifying examination.

Registration

Students must register within the dates and times listed on the school calendar. The place of registration will be announced prior to each period.

Residence

All work for advanced degrees must be registered for and completed at the University unless approval has been obtained from the director of the graduate school for work taken elsewhere.

Programs of Study

The study load for full-time students is usually four courses per quarter. Part-time students are limited to two courses per quarter unless permission to carry a heavier load is given by the departmental chairperson or a designate. Courses in most fields are offered both in the afternoon and evening.

Grading System

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory

This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

- I Incomplete without quality designation.
This grade may be given to those students who fail to complete the work of the course.
- L Audit without credit.
- S Satisfactory without quality designation.
- U Unsatisfactory without quality designation.

The I grade will be changed to a letter grade when the deficiency which led to the I is made up to the satisfaction of and in the manner prescribed by the instructor in the course, or, in the instructor's absence, by the chairperson of the department in which the grade is given. The period for clearing such a grade will be restricted to one calendar year from the date of its first being recorded on the student's permanent record.

Students must indicate their preference for auditing a course at registration. No credit will be given for the course. It will, however, appear on the student's transcript. Registration changes from an audit to a graded status, or vice versa, may only be made prior to the first day of classes.

Class Hours and Credits

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three-fourths of a semester hour credit.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year may be required to apply for readmission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the ninth week of the quarter. Students will be withdrawn as of the date on which the form is received by the Registrar's Office. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Changes in Requirements

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the most recent bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which the student entered becomes the binding one.

Application for the Diploma

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed in the calendar, there is no assurance that the degree will be granted in that particular year even though all other requirements have been fulfilled.

THE MASTER'S DEGREE

Admission

Specific requirements for each degree program will be found in the appropriate paragraphs for each department.

Academic Requirements

A candidate for the master's degree must complete a minimum of 40 quarter hours of correlated work of graduate caliber and such other study as may be required by the department in which the student is registered.

To qualify for the degree, a final average of 3.0, equivalent to a grade of B, must be obtained. This average will be calculated quarterly by the graduate school on the basis of A=4, B=3, C=2, and F=0 and will exclude any transfer credits or repeated courses.

Not more than six quarter hours of repeated courses or additional courses may be allowed in order to satisfy the requirements for the degree.

Within the above limitations, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

Comprehensive Examination

A final written or oral comprehensive examination may be required. This examination will be given at least two weeks before the commencement at which the degree is expected.

Thesis

A thesis must show independent work based on original material, be approved by the department graduate committee, and in cases where a department requires a grade, must receive a grade of B or better to be accepted.

Language Requirement

An examination to show evidence of ability in one or more foreign languages is required in some graduate programs. This knowledge is es-

established by an examination which will be administered by the graduate school at least twice yearly.

Transfer Credit

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided that the credits transferred consist of A or B grades in graduate-level courses, are in the candidate's field, have been earned at a recognized institution, and have not been used toward any other degree. Students should petition through their departments to the director of the graduate school in writing for all transfer credit. Transfer credit grades may not be used for the purpose of obtaining the academic average necessary for the completion of the degree requirements.

Time Limitation

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the Director of the Graduate School of Arts and Sciences.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school depending upon the nature of the program. It is the responsibility of the chairperson of the committee to certify to the Graduate School Office the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University.

Residence Requirement

Candidates for the Doctor of Philosophy degree must spend the equivalent of at least one academic year in residence at the University as a full-time graduate student. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of each degree program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate.

Course Requirements

The minimum course requirement of 40 quarter hours constitutes the work normally required for a master's degree. The course requirements beyond this in each doctoral program are specified by the committee in charge of the doctoral program.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program.

Language Requirement

The foreign language requirement is established by the committee in charge of each degree program.

Final Oral Examination

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

This examination will be taken after completion of all other requirements of the degree and must be held at least two weeks prior to the commencement at which the degree is to be awarded.

Transfer Credit

Approval for transfer credit may be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless

withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more departments. To meet this need, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following option is available.

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the director of the graduate school who forwards it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct the doctoral dissertation. This adviser, who may or may not be a member of the registration department, will be chairperson of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairperson. These two members will obtain one or more additional members or request the director of the graduate school to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairperson of the registration department will notify the director of the graduate school of the membership of the committees as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the

course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the director of the graduate school to determine whether objectives of the program are being met.



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FINANCIAL OBLIGATIONS

Tuition

Master's Degree Candidates

The tuition rate for 1978 - 1979 is \$81 per quarter hour of credit.

Doctoral Candidates

Tuition for full-time doctoral candidates in 1978 - 1979 is \$81 per quarter hour of credit. Doctoral candidates actively utilizing the resources of the University in their Ph.D. dissertation are charged an additional \$600 per quarter. Those doctoral candidates registered for dissertation work performed off campus are charged \$200 in addition to tuition charges each quarter, and those doctoral candidates who are no longer actively utilizing University resources are charged a continuation fee of \$50 per quarter.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University.

Fees

An application fee of \$15 is charged all students when they apply for the first time in the graduate school at Northeastern.

Other fees include a charge of \$2.00 for a deferred payment arrangement; an additional charge of \$10 for late payment of tuition; and a mandatory fee of \$25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. The fee for teaching assistants and research fellows is \$6.25 each quarter. All part-time students on the Huntington Avenue campus are charged \$.75 a quarter.

All full-time students will pay a nonrefundable University health services fee of \$140 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the student to the medical care furnished by the University Health Services. If students have their own medical insurance or are covered under another plan they may deduct \$72.00 from their health services bill and pay the difference. Teaching assistants and research fellows receive remission of health service fees. Tuition fellows must pay health service fees themselves. Part-time or continuation fee students must purchase health insurance independently. Tuition and fees are subject to change without notice.

All financial obligations to the University must be discharged by graduation.

Tuition rates and fees are subject to revision by the Board of Trustees at any time.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Amount of Refund	
Official Withdrawal Filed Within	Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

The Office of Financial Aid offers several types of assistance to graduate students. All awards are based on financial need. Since the majority of these awards are sponsored by the Federal Government, the amount of aid granted is dependent upon the amount of funds allocated to Northeastern University each year.

Only students who have been officially accepted as degree candidates may apply for financial aid. In addition, the University only awards financial aid to students who are U.S. citizens and permanent residents of the United States. Students who are studying in the United States on student visas are not eligible for Federal assistance.

Northeastern University is a participant in the Graduate and Professional School Financial Aid Service (GAPSFAS). All applicants must file a GAPSFAS in order to be considered for financial aid. All sections of the GAPSFAS, including the parents' section, must be completed and sent to the GAPSFAS, Box 2614, Princeton, New Jersey 08540. Northeastern University also requires a Graduate Student Application. These forms may be obtained in the Office of Financial Aid, 254 Richards Hall.

The following types of assistance are administered by the Office of Financial Aid:

National Direct Student Loan

This program is available to full-time graduate students who *need* a loan to meet their educational costs. Graduate students may borrow up to \$10,000 under this program. Repayment and interest do not begin until nine

months after the student ceases to carry at least a half-time academic load at any institution of higher education. Repayment may be extended over a ten-year period with an interest rate of three percent per annum. No payments are required for up to three years while a borrower is serving in the Armed Forces, Peace Corps, or VISTA. Cancellation provisions are available for borrowers who work in certain fields of teaching or specified military duty.

College Work-Study Program

This program is available to full-time graduate students who have financial need. It is designed to give students an opportunity to earn as much as \$3.75 per hour working in jobs on or off campus in public or private non-profit organizations. This program is administered solely by the Office of Financial Aid and should not be confused with the University's Cooperative Education Program.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least *one-half* the normal academic load, may borrow from a participating bank or other financial institution. Terms and conditions of these loans vary from state to state. New federal regulations affecting this program were signed into law on October 12, 1976 (S.2657). In some states, full-time graduate students may borrow up to \$5,000 per academic year. Loan recommendations are based on financial need. Students eligible for Federal Interest benefits are not subject to interest payments until nine months after they cease to carry at least a half-time academic load. Repayment may be extended for as long as ten years with an interest rate of seven per cent per annum. No payments are required for up to three years while a borrower is serving in the Armed Forces, Peace Corps, or VISTA. Information and applications are available from banks, State Guarantee agencies, and Regional Offices of the U.S. Office of Education. Massachusetts residents may contact the Office of Financial Aid for the necessary applications.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr., awards are made as openings occur to qualified minority graduate students who show financial need and are accepted to full-time study in the graduate schools of the University. Stipends will cover tuition and all fees. Applications for Martin Luther King Jr. Scholarships are available at the African-American Institute, 40 Leon Street, 437-3141.

Appointments

Northeastern University has available limited fellowships and assistantships for full-time students who are working toward the master's or

doctor's degree. Candidacy for these awards may be established by completing the relevant section of the application for admission. Those students already enrolled should consult their departmental adviser.

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of three quarters and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty adviser and the director of the graduate school.

Acceptance Conditions

Northeastern University, which is a member of the Council of Graduate Schools of the United States, subscribes to the following resolution of the Council:

Acceptance of an offer of financial aid (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by an actual or prospective graduate student completes an agreement which both student and graduate school expect to honor. In those instances in which the student accepts the offer before April 15 and subsequently desires to withdraw, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer.

Teaching Assistantships

A limited number of teaching assistantships allowing remission of tuition and a stipend are available in all departments. Holders of such awards devote half time to academic assistance directly related to the teaching function and the balance to course work.

Graduate Administrative Assistantships

Some University departments offer the graduate student an opportunity for remission of tuition and a stipend in return for half time spent in assisting with nonteaching, administrative duties. These assistantships are available on a limited basis.

Tuition Assistantships

Many departments provide remission of tuition to full-time students assisting eight hours a week in the administrative work of the department. These awards are normally given to students in the first year of graduate work and are available on a limited basis.

Research Fellowships

A number of departments offer a limited number of research fellowships including N.I.H., N.S.F., and N.D.E.A. carrying a stipend and remitting tuition. Certain of these grants require half-time work on research in the department, with the remaining time devoted to course work. Others provide for full-time work on research used for a thesis or dissertation.

Robert A. Feer Scholarship

This scholarship is awarded yearly to the outstanding candidate for the Master of Arts degree in History. The scholarship was established in memory of Professor Robert A. Feer who was a member of the Department of History from 1963 to 1970.

Dr. Ruth E. Sullivan Memorial Scholarship Fund

This fund was established at Northeastern University in 1976 through the generosity of family, friends, and colleagues of Dr. Sullivan who was a member of the Department of English from 1968 until her death in 1976. One or more scholarships are awarded annually to undergraduate or graduate students who demonstrate academic achievement and excellence in interdisciplinary studies in liberal arts such as literature and psychology, the field to which Dr. Sullivan contributed so significantly.

Dormitory Proctorships

A limited number of proctorships for men in dormitories on or near the Huntington Avenue campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

The federal aid programs listed above are available to citizens and permanent residents of the United States. All financial aid is available on a limited basis.



fields of study

The departmental sections that follow list courses available to a student during the typical period of attendance required to obtain a degree. The quarter in which a specific course will be offered will be found in the course announcement made available in May for the summer quarter and in June for the following academic year.

biology

Professors

Francis D. Crisley, Ph.D., University of Pittsburgh
Janis Z. Gabliks, D.D.S., Baltic University; Ph.D., Rutgers University
Charles Gainor, Ph.D., Michigan State University
Abdul-Karim Khudairi, Ph.D., University of California, Los Angeles
Nathan W. Riser, Ph.D., Stanford University, Director, Marine Science Institute
Fred A. Rosenberg, Ph.D., Rutgers University

Associate Professors

Joseph L. Ayers, Jr., Ph.D., University of California, Santa Cruz
Helen Lambert, Ph.D., University of New Hampshire
Charles A. Meszoely, Ph.D., Boston University
M. Patricia Morse, Ph.D., University of New Hampshire
Joseph V. Pearincott, Ph.D., Fordham University
Ernest Ruber, Ph.D., Rutgers University
Henry O. Werntz, Ph.D., Yale University, Chairperson

Assistant Professors

Joseph L. Ayers, Jr., Ph.D., University of California, Santa Cruz
Kostia Bergman, Ph.D., California Institute of Technology
Gwilym Jones, Ph.D., Indiana State University
William Hartner, Ph.D., University of Missouri
Duncan Munro, Ph.D., University of Michigan
Daniel Scheirer, Ph.D., Pennsylvania State University
Phyllis R. Strauss, Ph.D., Rockefeller University

GRADUATE PROGRAM

Procedure for Admission

All application forms and catalogs should be requested from the Office of the Graduate School of Arts and Sciences. Requests for information about programs should be directed to the program Graduate Director. There are three programs in Biology: Master of Science in Biology (full- or part-time); Master of Science in Health Science (full- or part-time); and Doctor of Philosophy (full-time only).

Financial Aid

General Policies: All full-time students enrolled in the Biology Department's master's or doctoral degree programs are eligible to be considered for financial aid. A full-time master's student is defined as one enrolled in approximately seven graduate credits per quarter and, in any case, one who will complete 20 graduate credits within one year.

As noted under *General Regulations of the Graduate School of Arts and Sciences*, all students who hold assistantships and research fellowships are

expected to devote full-time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty advisor and the Director of the Graduate School.

As a general departmental policy, a master's degree student is eligible for not more than two years of financial aid, and a doctoral student is not eligible for more than three years. After the first year, reappointments are considered on the basis of academic performance, and on professor and student evaluations from the assigned classes.

Application for Financial Aid: For consideration for financial aid, eligible students of any departmental program must include in their applications materials the Graduate Record Examination scores including the Advanced Test Scores in Biology. Awards are made on the basis of academic record, GRE scores, consideration of the awards available, and the candidate's experience and skills for teaching or research in the various fields. *Financial aid is available on a limited basis.*

THE MASTER OF SCIENCE IN BIOLOGY

The Master of Science in Biology is a research-oriented degree which is offered on a part-time or full-time basis. The Department offers opportunity for concentrations in areas of study both in course work and research. These areas include animal physiology, botany, cell biology, ecology, marine biology, microbiology, and zoology.

Admission

In addition to the requirements of the Graduate School of Arts and Sciences, applicants should have a background which includes one year each of organic chemistry, physics, and mathematics, and courses equivalent to the six quarter-courses of the biology undergraduate core curriculum (18.131-18.136). Students with deficiencies should remove them during the first 20 quarter-hours of graduate work.

Transcripts of academic work and three letters of recommendation are required. Graduate Record Examination (GRE) scores, including the Advanced Test in Biology, must be submitted. Admission decisions are made by the Biology Department's Sub-committee on Admissions.

Provisional and Regular Status

If a student has less than an optimum undergraduate average or has low GRE scores, the Graduate Admissions Subcommittee may admit the student with a provisional status. Under normal circumstances a student in this category is not eligible for financial aid. A provisional student must have a B average at the end of 12 quarter-hours of graduate credit. At that time he/she is given regular status (if maintaining a B average) or terminated from the program. A regular student is expected to maintain a B average but does not come under review at the end of the twelve hours and is eligible for all forms of financial aid.

Deficiencies

Deficiencies can be filled by 1) taking course equivalents in the Liberal Arts College; 2) taking University College (evening) courses; 3) taking equivalent undergraduate lecture-laboratory courses at another 4-year institution. Neither of the latter two will receive graduate credit.

Equivalents in University College of Liberal Arts Courses

<i>Liberal Arts</i>	<i>University College</i>
18.131 General Biology	18.411
18.132 Animal Biology	18.412 and 18.413
18.133 Plant Biology	18.419
18.134 Environmental & Population Biology	18.461, 18.462, and 18.463
18.135 Genetics & Developmental Biology	18.457, 18.458, and 18.459
18.136 Cell Biology	18.431, 18.432, and 18.433

It is strongly recommended that students take the regular Northeastern University day undergraduate courses and/or their 2 q.h. graduate credit equivalents (listed below) to remedy their deficiencies:

18.834	Environmental & Population Biology	(2 q.h.)
18.835	Genetics & Developmental Biology	(2 q.h.)
18.936	Cell Biology	(2 q.h.)

Academic Requirements

Forty hours of academic work are required to complete the M.S. in Biology. Of this, 20 hours must be work in Biology Department graduate courses (18.200, 18.800, 18.900 courses, excluding 18.980, 18.990, 18.991, 18.992, and 18.994). In addition, 4 hours of seminars (18.980) and 6 hours of research (18.981 M.S. thesis or 18.994 M.S. Literature Dissertation) are required. Of the remaining 10 hours required, 4 may be additional research credits (18.990, 18.991, 18.992, 18.994) or all may be Biology Department graduate courses (excluding 18.980) or approved graduate courses from other Departments within the University. Any transfer credit is included within these 10 hours.

Note, in any case, a maximum of 10 hours of research courses is applicable to the M.S. degree which must include a minimum of 6 hours of 18.991 or 18.994.

A cumulative average of 3.0 for all graduate work is required for the award of the M.S. degree. All regulations of the Graduate School of Arts and Sciences apply with regard to maintenance of academic standing.

Research

Either 6 hours of M.S. thesis (18.991) or 6 hours of M.S. Literature Dissertation (18.994), both of which culminate in a written report, are required for the M.S. in Biology.

M.S. Thesis—The M.S. thesis involves a program of laboratory or field research leading to the writing and oral defense of the thesis itself. The candidate works under the direction of a member of the graduate faculty and a committee of two other biology graduate faculty members.

M.S. Literature Dissertation—The M.S. Literature Dissertation involves a program of extensive literature research leading to a comprehensive written review of a significant biological problem, and an oral examination. This study is undertaken with a member of the biology graduate faculty and a committee of two other biology graduate faculty.

MASTER OF SCIENCE IN HEALTH SCIENCES

The M.S.H.S. degree is offered to provide a more flexible set of options for students interested in the Health Sciences and is offered on a full-time or part-time basis.

Admission

In addition to the requirements of the Graduate School of Arts and Sciences, applicants should have a background which includes one year each of organic chemistry, physics, and mathematics, and courses equivalent to the six quarter-courses of the biology undergraduate core curriculum (18.131-18.136). Students with deficiencies should remove them during the first 20 hours of graduate work. In the M.S.H.S. program, some flexibility is allowed in the way in which these deficiencies may be removed (or waived), with the approval of the Graduate Director of the program, and the department's Graduate Committee.

Candidates are required to submit transcripts of academic work, and three letters of recommendation.

Academic Requirements

For the M.S.H.S., the candidate must complete 40 hours of academic work. Of this, 20 hours must be course work in Biology Department graduate courses (18.200, 18.800, 18.900 excluding 18.980, 18.990, 18.991, 18.994). In addition, 4 seminars (18.980) are required. Two of these seminars, with prior approval of the Graduate Committee, may be graduate seminars offered by other departments in the University. The remaining 16 hours of graduate credit may be Biology Department graduate courses, up to 6 hours of research courses (including 18.992), or approved graduate courses from other departments in the University. A maximum of 12 hours of transfer credit is included within these 16 hours.

A cumulative average of 3.0 for all graduate work is required for award of the M.S.H.S. The regulations of the Graduate School apply with regard to maintenance of academic standing.

Final Comprehensive Exam

In the final year of graduate study, the M.S.H.S. candidate must successfully complete a written final comprehensive examination in a major and minor area, unless the research option (described below) is exercised. This examination is designed to test the candidate's proficiency in the areas of study. If not successfully completed, one reexamination is permitted.

Research Option

A research option (M.S. thesis or Literature Dissertation) is available and all rules as stated in the M.S. Biology apply. A successful oral defense of thesis or literature dissertation may substitute for the final comprehensive exam.

THE DOCTOR OF PHILOSOPHY

Admission

Only applicants who have a master's degree or its equivalent at entry may be considered for direct admission to the doctoral program. Those who do not may be considered only after admission to the master's program and after satisfactory completion of 30 hours of graduate study, which must include completion of some research. In addition, a student must have a written agreement on the part of a graduate faculty member to serve as the thesis adviser.

Residence Requirement

After admittance to the doctoral program, the student may satisfy the residence requirement by one year of full-time graduate work or by two years of half-time graduate work.

Qualifying Examination

This exam is an oral examination which is intended to evaluate the student's knowledge of the basic principles inherent in the various areas of biology as represented in the core curriculum and to ascertain the student's readiness to continue in the research program in the area chosen. Students *must* take the qualifying exam by the end of three quarters at Northeastern University.

Teaching Requirement

A Ph.D. candidate is required to spend one year as a Teaching Assistant in the Department or demonstrate some equivalent amount of teaching to be approved by the Department Graduate Committee.

Language Requirement

Ability to read and translate biological literature in two foreign languages must be established by the candidate. The primary languages for Biology

are French, German, and Russian. Students will be expected to choose from these languages for their examinations; however, another language may be substituted where there is significant literature in the area of interest.

One of the language requirements may be fulfilled by completion of a program in the general principles of statistics, biometry, and/or computer programming.

Ph.D. Comprehensive Examination

The comprehensive examination may be taken by the Ph.D. candidate after passing at least one of the language requirements or its equivalent. The questions on the examination are designed to test whether the student's knowledge of concepts and methods of the area are sufficiently comprehensive and profound to enable him/her to enter on a career of fruitful teaching and research. The examination in the major field will delineate the candidate's potential to teach advanced courses, while the minor examination will show competency to teach undergraduate courses in that field.

Thesis

The thesis is the most important part of the Ph.D. degree and must be an original and independent scientific study. The thesis adviser and student will work closely to evolve the problem and arrange for a Ph.D. thesis committee. The minimum number of members for a Ph.D. committee is five. One member must be an acknowledged expert from outside the University.

SPECIAL STUDENT STATUS

Special students are not matriculated in a degree program and acceptance as a special student is not related to admission into a departmental degree program. However, those special students who are subsequently admitted into a degree program may apply the *first 12* hours of graduate credit earned as a special student toward degree requirements. Special students are expected to maintain a B average in the first 12 quarter hours of study. The M.S.H.S. Graduate Director is the overseer for special students.

Further information on admission procedures and standards can be obtained from the Graduate School of Arts and Sciences or the M.S.H.S. Graduate Director.

INTERDISCIPLINARY PROGRAMS

Admission

Application and credentials for admission to interdisciplinary programs involving the Biology Department, where this department is clearly the department of registry, as described under "General Regulations," should be submitted as described under the heading of "Admission" in the section

"The Doctor of Philosophy" for biology. The interdisciplinary committee will consist of at least five members. The composition of this committee will be determined by mutual consent between the departments involved, but will have at least three members from the Biology Department if the dissertation adviser is from this department. Upon admission, suitable interdisciplinary course requirements will be determined by the interdisciplinary committee.

Qualifying Examination

Students accepted into the program will normally be expected to complete the qualifying examination by the end of three quarters at North-eastern University. At least five areas of study will be covered by the qualifying examination, at least three of which will be oral examinations chosen by the candidate from the following areas: biochemistry, botany, ecology, genetics, microbiology, physiology, and zoology. The remaining components of the examination will be specified and evaluated by the other participating department. With the exceptions of the procedures for admission and examinations for qualification, the remaining requirements and procedures are as specified under "The Doctor of Philosophy" for biology.

DESCRIPTION OF COURSES

18.804 Lower Invertebrates (4 q.h.)

Taxonomy, morphology, embryology, and life histories of acoelomate phyla (Marine Science Institute).

18.805 Coelomate Invertebrates (4 q.h.)

Biology of annelids, arthropods, molluscs and echinoderms (Marine Science Institute).

18.806 Malacology (4 q.h.)

Functional morphology, embryology, systematics, and ecology of the major groups of molluscs. *Prep. Invertebrate Zoology.*

18.810 Ichthyology (4 q.h.)

Natural history and systematics of fishes, with emphasis on marine species (Marine Science Institute). *Prep. Comparative Anatomy or Vertebrate Zoology.*

18.813 Dynamics of Aquatic Ecology I (3 q.h.)

Chemical, physical and biotic features influencing coastal, lake and stream communities. Lectures. *Prep. 18.134 or 18.834 or equivalent.*

18.814 Dynamics of Aquatic Ecology II (3 q.h.)

One hour of lecture and one full day (7 hours) of laboratory-field work. *Prep. 18.813.*

18.818 Ecology of Salt Marshes (3 q.h.)

Survey of fauna and flora, environmental factors affecting them and current biological and social problems associated with this habitat. This course will meet for 2 lectures of 1½ hours each and 1 full day of laboratory for 6 weeks during the summer quarter. *Prep. 18.134 or 18.834 or equivalent.*

18.823 Human Ecology (4 q.h.)

Parameters of the human ecological niche, people's effect on them, and their consequences for people.

18.825 Plant Nutrition and Metabolism (4 q.h.)

Mineral nutrition, photosynthesis, metabolic pathways, and translocation in higher plants.

18.826 Plant Growth and Reproduction (4 q.h.)

Plant hormones, growth, development, and physiology of reproduction. *Prep. 18.825.*

18.830 Marine Algae (4 q.h.)

Systematics, life histories, and ecology of marine algae, with emphasis on the flora of the Gulf of Maine (Marine Science Institute).

18.831 Plant Morphogenesis (4 q.h.)

The origin of form, experimentally controlled development, and external and internal factors that govern development of form. Plant tissue, organ, and cell culture techniques employed in the study of morphogenetic processes. *Prep. 18.237.*

18.834 Environmental and Population Biology (2 q.h.)

Physico-chemical factors influencing and influenced by organisms. Interactions among individual organisms and among species. Students will participate in lectures and laboratories given for 18.134. Individual work on specialized aspects of ecology will be assigned. *Prep. One year of General Biology, including plant and animal biology. Open only to graduate students completing deficiencies in entrance requirements.*

18.835 Genetics and Developmental Biology (2 q.h.)

Elaboration of the classic laws of heredity. Cytogenetics. Chemical basis of heredity. Selected examples of the development of form and function. Students will participate in lectures and laboratories given for 18.135 and will be assigned extra individual work. *Prep. General Biology. Open only to graduate students completing deficiencies in entrance requirements.*

18.836 Cardiovascular Physiology (3 q.h.)

Physiology of blood cells, anemia, polycythemia immunity and allergy. Electrophysiology of the heart, cardiac cycle, EKG, hemodynamics, capillary dynamics, pulmonary circulation, cardiovascular reflexes, cardiac output and venous return. Cardiac failure, coronary circulation, atherosclerosis, hypertension, cerebral circulation, circulatory shock.

18.837 Cardiovascular Physiology Laboratory (1 q.h.)

Three hours of laboratory study per week. *Prep. 18.836.*

18.838 Animal Nutrition (2 q.h.)

Detailed consideration of organic and inorganic nutritional requirements of humans and selected animals. Digestion, absorption, and metabolism of nutrient materials. Role of vitamins, minerals, and trace elements in metabolism. Variation in nutritional needs among normal individuals and in various physiologic and genetic pathologies. Evaluation of food additives and of permissible levels of toxic materials in food. *Prep. Basic Biochemistry or consent of instructor.*

18.839 Principles of Systematics (2 q.h.)

Presentation of theories and techniques employed in systematics; rules according to the International Codes of Zoological and Botanical Nomenclature.

18.840 Osmotic and Ionic Regulation (2 q.h.)

Comparative physiology of regulation and transport of water and the principal solutes in animals. Principles and underlying mechanisms will be discussed, as well as examples selected from a variety of phyla. *Prep. Basic Physiology.*

18.842 Vertebrate Endocrinology (2 q.h.)

Principles of hormonal regulation of physiological processes in vertebrates, mechanisms of hormone action, neuro-endocrine relationships. *Prep. Physiology.*

18.843 Environmental Physiology (3 q.h.)

Study of the mechanisms for short-term and chronic adaptation to changes in environmental conditions. Consideration of physiological responses to high altitudes, diving, thermal environment, space travel, and biological clocks. Endothermic vertebrates are emphasized. For students with background in physiology. *Prep. Basic Animal Physiology or consent of instructor.*

18.847 Environmental Law (2 q.h.)

The kinds of scientific information required for implementation of the legal and political aspects of environmental management. The role of the scientist as an expert witness. Scientific and legal predictability. Analyses of suitable dynamic models and case law with the goal of improving the results of legal, political, and scientific decisions bearing upon remedial environmental management. *Prep. Biology core and first course in physiology, e.g., 18.252 and 18.253.*

18.852 Advanced Developmental Biology (3 q.h.)

Analysis of development at the biochemical and cellular levels. Nucleic acid and protein synthesis, gene action and differentiation, cell-cell interactions, mechanisms of animal morphogenesis. 3 hrs. of lecture. *Prep. 18.135, 18.136 or consent of the instructor.*

18.853 Advanced Developmental Biology Laboratory (2 q.h.)

Analysis of the fundamental problems of development through experimental techniques. Culture of vertebrate and invertebrate embryos; microsurgical analysis of morphogenesis; biochemistry of development, cell-cell interactions; organ and tissue culture will be studied. 5 hours of laboratory per week. *Prep. 18.852 or consent of the instructor.*

18.857 Experimental Mammalian Physiology (4 q.h.)

Experimental study of the circulatory, respiratory, digestive, excretory, reproductive, nervous and endocrine systems in mammals, with emphasis on laboratory procedures and surgical techniques used with living animals — chiefly, the rat. *Prep. Background in Physiology, consent of the instructor.*

18.860 Cell Biophysics and Biochemistry (5 q.h.)

Biogenesis and ultrastructure of the cell considered together with the biophysical procedures and biochemical patterns used in the study of cellular and tissue components. Lecture only. *Prep. Organic Chemistry, General Biology, Biochemistry and Cell Biology.*

18.863 Neurophysiology (2 q.h.)

Biophysical function of nerve cells including the resting potential, conduction and transmission, reception of stimuli, and coding of neuronal signals. *Prep. Physics and Basic Animal Physiology.*

18.864 Neurophysiology Laboratory (2 q.h.)

Introduction into neurophysiological methods. *Prep. 18.864 (May be taken concurrently).*

18.869 Nervous Control of Homeostatic Functions (3 q.h.)

Lecture and discussion of the nervous control of ventilation, heart and vascular system, water and salt intake, feeding and body weight, energy metabolism, arousal, pain mechanisms, and factors affecting autonomic function. Emphasis on higher vertebrates. *Prep. Basic Animal Physiology.*

18.872 The Gastrointestinal Tract (3 q.h.)

A study of structure, function, and, where appropriate, the pathology of the gastrointestinal tract. A histological overview of the structure of all areas of the tract, including the liver and gallbladder, will be followed by a functional analysis covering secretion, absorption, and bile formation and release. *Prep. Basic Animal Physiology or consent of instructor.*

18.890 Biology of Meiofauna (2 q.h.)

Systematics and ecology of marine interstitial fauna. *Prep. Invertebrate Zoology.*

18.903 Environmental Microbiology (4 q.h.)

The microbial environment and ecology of the cell. Interactions between microbial populations, stressing soil and fresh-water associations. *Prep. 18.220 or equivalent.*

18.906 Food Microbiology (3 q.h.)

Microbiology of food with emphasis on the pathogenic types and their interactions with other groups indigenous to food. Food fermentations, food processing, and environmental factors influencing growth and development of microorganisms in food. *Prep. 18.220 or equivalent.*

18.908 Food Microbiology Laboratory (2 q.h.)

Detection, quantification, and isolation of microorganisms and their products of significance in food with emphasis on the pathogenic types. *Prep. 18.907 (may be taken concurrently).*

18.910 Microbial Genetics (3 q.h.)

The principles and practical application of the genetics of microorganisms. The course will emphasize genetic exchange in bacteria mediated by bacteriophage and plasmids. Several eukaryotic systems will also be discussed. *Prep. 18.220 or equivalent.*

18.911 Microbial Genetics Laboratory (2 q.h.)

The methods of genetics, including the isolation and mapping of mutants, will be applied to an original research problem in microbial physiology. *Prep. 18.910 (may be taken concurrently) and consent of instructor.*

18.912 Animal Virology (3 q.h.)

Physical and chemical properties of viruses, viral replication, genetics, cytopathology, and tumor viruses. Medical virology: pathogenesis, clinical features, epidemiology, and immunization of the common viral diseases. *Prep. 18.220 or equivalent.*

18.913 Virology Laboratory (2 q.h.)

Cultivation and identification of viruses. Use of animals, eggs, and animal cell cultures for viral assays. *Prep. 18.912 (may be taken concurrently).*

18.920 Industrial Microbiology (3 q.h.)

Microorganisms and methods employed in production of products of economic and medical importance, decomposition of wastes, and control of desirable and unwanted processes and biodeterioration. Fermentation processes emphasized. *Prep. 18.240 or equivalent or consent of instructor.*

18.921 Industrial Microbiology Laboratory (2 q.h.)

Laboratory and discussion seminar sessions devoted to the study of selected commercial processes.

18.936 Cell Physiology and Biochemistry (2 q.h.)

Basic chemical and physical processes of cells related to their fine structure; oxidative and intermediary metabolism; photosynthesis, membrane phenomena; movement; chemical and physical processes of prokaryotic and eukaryotic cells. Students will participate in lectures and laboratories given for 18.136. Extra individual work will be assigned. *Prep. General Biology, college physics, and organic chemistry. Only open to graduate students completing deficiencies in entrance requirements.*

18.940 Microbial Biochemistry (4 q.h.)

Study of enzymatic reactions, including their mechanism and regulation, involved in pathways of energy metabolism and biosynthesis by microorganisms. The mechanism of action and research use of antibiotics will be discussed. *Prep. A term or more of Biochemistry.*

18.980 Seminar (1 q.h.)

Various topics and newer developments in botany, microbiology, physiology, and zoology covered in depth. Student presentations are emphasized.

18.990 Special Topics in Biology (credit variable)

Special study of a selected topic under direction of a faculty member, preliminary to submission and approval of M.S. Thesis proposal or M.S. Literature Dissertation proposal. Topic and direction of study to be arranged with the faculty member supervising the study. *Credits convertible to M.S. Thesis or M.S. Dissertation.*

18.991 M.S. Thesis (credit variable)

Research methods of some special field and their application to a specific problem, under direction of a faculty member.

18.992 Special Investigations in Biology (credit variable)

Studies on a topic not directly related to research being pursued for a thesis or dissertation.

18.993 Biological Electron Microscopy (4 q.h.)

Techniques of electron microscopy applied to biological materials. Specimen preparation, fixation, thin-sectioning, staining, operation of electron microscope, photographic techniques, interpretation of electron micrographs. Student seminars and project required. *Prep. Consent of the instructor.*

18.994 M.S. Literature Dissertation (credit variable)

An extensive literature research under the direction of a biology graduate faculty member leading to a comprehensive written review of a significant biological problem and an oral examination.

18.995 Ph.D. Dissertation

Original research in depth, representing a significant contribution of new biological knowledge, and a written dissertation thereon, under the supervision of a faculty member.

90.821 Biochemistry I (2 q.h.)

Discussion of the structures and chemistries of carbohydrates, proteins, lipids, nucleic acids, and selected cofactors. *Prep. One year Organic Chemistry.*

90.822 Biochemistry II (2. q.h.)

Bioenergetics, enzymes and enzyme kinetics, intermediary metabolism, including carbohydrate catabolism, tricarboxylic acid cycle, electron transport, and oxidative phosphorylation. *Prep. Biochemistry I (90.821).*

90.823 Biochemistry III (2 q.h.)

Continuation of intermediary metabolism from Biochemistry II, including lipid, protein, and nucleic acid metabolism, photosynthesis, and cell regulation. *Prep. Biochemistry II (90.822).*

Most undergraduate biology courses in the series designated 18.200-18.300 are available for graduate credit. Please consult the undergraduate or other appropriate bulletin for course details. In particular, the following courses are so considered:

18.206	Evolution	4 q.h.
18.207	Vertebrate Zoology	4 q.h.
18.208	Comparative Vertebrate Anatomy	5 q.h.
18.209	Embryology	5 q.h.
18.210	Invertebrate Zoology	5 q.h.
18.211	Parasitology	4 q.h.
18.212	Vertebrate Paleontology	4 q.h.
18.213	Mammalogy	4 q.h.
18.220	General Microbiology	5 q.h.
18.227	Animal Histology	4 q.h.
18.228	Histological Technique	3 q.h.
18.231	Lower Plants	4 q.h.
18.232	Higher Plants	4 q.h.
18.234	Plant Anatomy	4 q.h.
18.235	Economic Botany	4 q.h.

18.236	Horticulture	4 q.h.
18.237	Introduction to Plant Physiology	5 q.h.
18.238	Local Flora	4 q.h.
18.239	Terrestrial Ecosystems of North America	4 q.h.
18.240	Microbial Physiology	4 q.h.
18.242	Medical Microbiology	4 q.h.
18.245	Serology-Immunology	3 q.h.
18.246	Serology-Immunology Laboratory	2 q.h.
18.248	Marine and Freshwater Microbiology Laboratory	2 q.h.
18.249	Marine and Freshwater Microbiology	2 q.h.
18.251	Comparative Animal Physiology	4 q.h.
18.252	Vertebrate Physiology I	3 q.h.
18.253	Vertebrate Physiology II	3 q.h.
18.260	Advanced Cell Biology	4 q.h.
93.180	Physical Biochemistry	4 q.h.
93.185	Molecular Biology	4 q.h.
93.190	Advanced Biochemistry Laboratory	4 q.h.

The following courses have been reviewed by the Biology Department Graduate Committee and may be taken for graduate credit. Restrictions on the permissible amount of course credit outside of the 18.000 and Biochemistry courses are described in the "Academic Requirements" for programs leading to the Master of Science degree in Biology and to the Master of Science degree in Health Sciences.

73.814 Concepts in Pharmacology I (2 q.h.)

Selected areas of pharmacology are examined in depth with special reference to interactions of drugs and other chemical agents with biological systems. Emphasis is placed on biochemical mechanisms, experimental design, evaluation of data utilizing conventional statistical procedures, and techniques employed in pharmacological evaluations. Alternates yearly with 73.816.

73.815 Concepts in Pharmacology II (2 q.h.)

Continuation of 73.814.

73.816 Concepts in Toxicology I (2 q.h.)

Concepts of modern toxicology in which emphasis is placed on biochemical mechanisms underlying the toxicological action of drugs and other chemical substances upon biological systems. Selected topics in toxicology, including acute, sub-acute, and chronic effects of drugs in the experimental animal. Consideration of the predictive value of animal studies for drug effects in man. Alternates yearly with 73.814.

73.817 Concepts in Toxicology II (2 q.h.)

Continuation of 73.816.

01.952 Industrial Hygiene (2 q.h.)

Factors in the industrial environment that adversely affect the health, comfort, and efficiency of the worker. Industrial surveys, and application of engineering principles to control of dust, toxic metals, gases and vapors, organic compounds, radiation, pressure, temperature, and humidity.

01.957 Air Pollution Science (2 q.h.)

Theory and practice related to engineering management of air resources, control of gaseous emission, investigation and study of air pollution, sampling and analysis methods.

11.872 Radiation Biology and Health Physics (2 q.h.)

Prep. consent of the instructor.

chemistry

Professors

Karl Weiss, Ph.D., New York University, Chairperson
Bill C. Giessen, Dr. Sc. Nat., University of Göttingen
Barry L. Karger, Ph.D., Cornell University
John L. Neumeyer, Ph.D., University of Wisconsin
Robert F. Raffaui, Ph.D., University of Minnesota
Robert A. Shepard, Ph.D., Yale University
Alfred Viola, Ph.D., University of Maryland

Associate Professors

Geoffrey Davies, Ph.D., Birmingham University
Arthur M. Halpern, Ph.D., Northeastern University
David M. Howell, Ph.D., University of Michigan
Conrad M. Jankowski, Ph.D., State University of Iowa, C. Chem.
Elmer E. Jones, Ph.D., Washington University
Philip W. LeQuesne, Ph.D., University of Auckland
John L. Roebber, Ph.D., University of California, Berkeley, Executive Officer
William M. Reiff, Ph.D., Syracuse University
Robert N. Wiener, Ph.D., University of Pennsylvania

Assistant Professors

Thomas F. Brennan, Ph.D., State University of New York at Stony Brook
Thomas R. Copeland, Ph.D., Colorado State University
James E. Quick, Ph.D., University of Pittsburgh
David E. Seitz, Ph.D., Northwestern University

Admission

In addition to the admission requirements listed on page 14 an applicant must have completed a full year of undergraduate organic chemistry, physical chemistry, analytical chemistry, calculus and physics. Admission policy favors those who have taken courses beyond the minimum above.

These admission requirements may be modified to accommodate applicants who have taken fewer courses than indicated above, but who have outstanding records and a strong interest in chemical or interdisciplinary studies. See also the description of interdisciplinary programs.

Program Planning

Prospective students and current students should discuss their programs with a departmental adviser. The departmental advisers may be reached by calling 437-2822 and would welcome discussion of curriculum matters and program planning.

DEGREE REQUIREMENTS

Part-Time Program Leading to M.S. Degree

This program consists of a total of 40 quarter hours of credit in graduate course work, of which 32 credits must be taken in chemistry graduate courses numbered between 12.821 and 12.899. Eight additional credits may be taken in any graduate courses for which the student has the necessary prerequisites. The student's program must include the following core courses in the four areas of chemistry:

- (a) Four credits of analytical chemistry. These may be chosen from 12.821, 12.822, 12.823, 12.831, 12.832 and 12.833.
- (b) Four credits of inorganic chemistry. These will normally be the 12.841 and 12.842 sequence.
- (c) Four credits of organic chemistry. These may be either the 12.861 and 12.862 sequence or the 12.864 and 12.865 sequence.
- (d) Four credits of physical chemistry. These may be either the 12.881 and 12.882 sequence or the 12.885 and 12.886 sequence. Note that 12.881 and 12.885, by themselves, are not sufficient.

In cases of unusual preparation, more advanced courses may be substituted within the given subdiscipline.

Full-Time Program

Master's Degree

The normal full-time program consists of a total of 40 quarter hours of graduate credit in courses, seminars, research, and a thesis based on this research. Each student is required to take at least 24 quarter hours of credit in graduate chemistry courses numbered between 12.821 and 12.899. Up to 4 quarter hours of graduate courses in physics or mathematics may be substituted. At least one two-quarter sequence of courses must be taken in three out of the four areas of chemistry. These sequences would normally be chosen from the following core courses:

- (a) Analytical Chemistry — 12.821 and 12.831 or 12.822 and 12.832 or 12.823 and 12.833.
- (b) Inorganic Chemistry — 12.841 and 12.842
- (c) Organic Chemistry — 12.861 and 12.862
- (d) Physical Chemistry — 12.881 and 12.882 or 12.885 and 12.886.

A minimum of 6 hours, but no more than 14 quarter hours of credit may be assigned to 12.991, Research and Thesis for the Master of Science degree. Each student is required to attend 12.990, Seminar, in each term. One credit is assigned to a student for each term in which the student conducts a seminar, up to the maximum of 2 credits.

DOCTOR OF PHILOSOPHY DEGREE

The doctoral program in chemistry may be pursued only in residence. The additional requirements beyond those of the master's degree are designed to demonstrate superior proficiency in original research, including technical reading ability in a foreign language and familiarity with current advances in one of the main divisions of chemistry.

Residence Requirement

The residence requirement is satisfied after one year of full-time graduate work or two years of half-time work. If a student holds a teaching assistantship which occupies one half of the student's time, the residence requirement is being discharged at half rate. Other arrangements require faculty approval. If a candidate has a research fellowship which supports the research for the doctoral dissertation, the residence requirement is discharged at full rate. Normally, the equivalent of two years of work after establishment of doctoral candidacy is necessary to complete research.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

Qualifying examinations are offered in the fields of analytical, inorganic, organic, and physical chemistry. There are eight examinations offered each year in each field. A student must pass four of these.

A student is eligible to take the qualifying examination if:

- (a) the student has entered with a bachelor's degree and has achieved a 3.0 average in eight courses taken in the first year of residence. Two of the eight graduate courses may be in physics or mathematics, the remaining courses must be numbered between 12.821 and 12.899;
- (b) the student has been admitted to the doctoral program with an awarded master's degree;
- (c) the student is a part-time student who has petitioned the department after having completed at least sixteen credits of graduate courses which include fulfillment of three of the four distributional requirements listed for the part-time program. A 3.0 average is required for all courses taken.

Students in category "a" must pass the qualifying examinations by July 1 of their second year of residence. Students in category "b" must pass the qualifying examinations by July 1 of their first year of residence. Students in category "c" will have the conditions set at the time their petition is approved.

Course Requirements

A candidate is normally required to complete some course work beyond the 40 quarter hour minimum. The number and nature of these courses are individually determined for each candidate in consultation with the dissertation adviser.

Dissertation

In most cases, arrangements for a dissertation adviser will have been made before the completion of the qualifying examination. If not, such arrangements must be made as soon as possible after degree candidacy has been established. The dissertation adviser directs the research for the dissertation and serves as chairperson of the dissertation committee, which must approve the dissertation before the degree may be conferred.

Language Requirements

Proficiency must be demonstrated in a foreign language as specified by the departmental graduate committee in accordance with the general graduate school regulations. French, German, and Russian are the acceptable foreign languages. Normally, proficiency is demonstrated by taking examinations administered by the Chemistry Department.

Final Oral Examination

This examination will be held in accordance with the graduate school regulations.

AREAS OF ADVANCED STUDY AND RESEARCH

Analytical Chemistry

The general areas of active research include separation science, application of analytical methods to a wide range of problems in optical methodology, electroanalytical methods, forensic, clinical, and oceanographic analysis.

Inorganic Chemistry

Research in inorganic chemistry is largely concentrated on the structure and properties of transition elements and their compounds. Current investigations range from solid state studies to the thermodynamics and mechanism of reactions in solution. The application of inorganic chemistry in the field of forensic science is also under investigation.

Organic Chemistry

Research in the organic chemistry division is concentrated in the areas of organic synthesis, organic reaction mechanisms and natural products, and phytochemistry.

Physical Chemistry

The physical chemistry division has active research programs in the areas of photophysics, fluorescence spectroscopy, solution and gas phase photochemistry, molecular spectroscopy, physical solid state chemistry including X-ray diffraction, and theoretical studies of molecular systems.

Research Facilities and Equipment

The main facilities of the department are located in Hurtig Hall. Substantial additional space and equipment are available in the Institute of Chemical Analysis, Applications and Forensic Science in Mugar Hall, in the Forsyth Building, and at the University's Marine Science Institute at Nahant. Major research equipment includes:

- ☐ electron spin, nuclear magnetic resonance, and mass spectrometers
- ☐ liquid and gas chromatographs and an atomic absorption spectrometer
- ☐ X-ray diffractometers, an electron microscope and thermal analyzers and calorimeters
- ☐ Gouy and Faraday magnetic balances and a vibrating sample magnetometer
- ☐ vacuum ultraviolet, electron impact, photoionization, ultraviolet, visible, and infrared spectrometers
- ☐ flash photolysis, laser photolysis, and photochemical equipment
- ☐ Mössbauer spectrometer and low-temperature facilities
- ☐ fluorescence emission and lifetimes and a stopped-flow apparatus
- ☐ electroanalytical, polarographic, and coulometric equipment

Interdisciplinary and Other Graduate Chemistry Programs

Some graduate students wish to pursue doctoral programs which involve substantial work in two or more departments. The chemistry department has served as the registration department for a number of students engaged in such areas. The details of establishing such a program tailored to a student's individual needs are explained on page 20 of this bulletin.

Interdisciplinary Ph.D. in Forensic Chemistry

This program is designed to prepare a student for research and leadership positions in forensic laboratories. It is offered in conjunction with the College of Criminal Justice and the Institute of Chemical Analysis, Applications and Forensic Science. Details are given on page 58. Application material can be obtained by writing to:

Graduate Program in Forensic Chemistry
 Institute of Chemical Analysis, Applications and Forensic Science
 Northeastern University
 360 Huntington Avenue
 Boston, Massachusetts 02115

Master of Science in Forensic Chemistry

This program is available on a full-time or part-time basis with courses being offered primarily during the evening hours. Details are given on page 58. Application material can be obtained by writing to:

Graduate Program in Forensic Chemistry
 Institute of Chemical Analysis, Applications and Forensic Science
 Northeastern University
 360 Huntington Avenue
 Boston, Massachusetts 02115

Master of Science in Clinical Chemistry

This is a part-time interdisciplinary program with the College of Pharmacy and Allied Health Professions. It is designed to prepare a student for employment in clinical laboratories. Students must apply for this program through the College of Pharmacy and Allied Health Professions. Details are given on page 53.

DESCRIPTION OF COURSES

All courses carry two quarter hours of credit unless otherwise specified.

12.810 Modern Methods of Analysis (3 q.h.)

Training in a wide variety of modern methods of instrumental analysis with extensive "hands-on" experience provided by a laboratory section. Areas covered include: data handling; spectroscopy (UV-visible and IR absorption, luminescence, X-ray, atomic absorption and mass spectrometry); separations (gas and modern liquid chromatography, TLC); pulse polarography; X-ray diffraction; microscopy (optical and scanning electron microscopy including X-ray fluorescence microanalysis); computerized instrumentation. (Restricted to students in the Forensic Chemistry M.S. program).

12.811, 12.812, 12.813 Special Topics in Chemistry: Chemistry and Society I, II, III

Special topics of current importance including: Chemical Aspects of the Environment: pollution and its determination, pesticides, carcinogenics, resources; Chemical Aspects of Energy Conversion and Storage: fossil fuels and fuel analysis; nuclear reactors; storage batteries; hydrogen production and storage; solar energy, photovoltaic cells and photochemistry; energy related materials. *Prep. Bachelor's degree in science or engineering.*

12.821 Analytical Separations

Theory and practice of analytical separation techniques. Emphasis will be on fundamentals as they relate to practice. Topics will be based mainly on chromatographic processes including gas and high-speed liquid chromatography. Other topics will include zone refining, liquid-liquid extraction, and electrophoresis.

12.822 Electroanalytical Chemistry I

The theory, applications, and instrumentation for potentiometry, pH, ion selective electrodes, conductancy and high frequency measurements. The techniques of direct measurement, titration endpoint detection, and on-line measurements.

12.823 Optical Methods of Analysis I

Theory and practice of absorption spectrometric methods of analysis. Optics and basic instrumental considerations.

12.824, 12.825, 12.826 Special Topics in Analytical Chemistry I, II, III

Selected topics of current importance in analytical chemistry.

12.829 Computers in Chemistry (3 q.h.)

A laboratory-lecture course illustrating the use of small digital computers for real-time control of chemical instruments. Topics will include digital logic, real-time data structures, A/D and D/A conversion, noise, and other aspects of real-time computer interfacing. Programming will be done on a PDP-11 computer in MIRACL, a language designed for real-time processing. *Prep. Consent of instructor.*

12.831 Advanced Analytical Separations

Continuation of 12.821. *Prep. 12.821.*

12.832 Electroanalytical Chemistry II

The theory, applications, and instrumentation for electrogravimetry, polarography, voltammetry, chronopotentiometry, coulometric titration. Techniques for direct measurement, titration endpoint detection and on-line measurements.

12.833 Optical Method of Analysis II

Emission and fluorescence methods of analysis including atomic techniques, x-ray fluorescence and Raman spectrometry. Detailed discussion of parameters affecting signal to noise ratios and signal to noise enhancement.

12.841 Advanced Inorganic Chemistry I

Application of basic quantum chemistry to inorganic systems. Russell-Saunders and j-j coupling. Stereo chemistry of non-transition-metal compounds; bonding and structure of electron deficient systems.

12.842 Advanced Inorganic Chemistry II

Magnetic properties; electronic spectra and selection rules. Thermodynamic stability of coordination compounds. Experimental techniques of inorganic chemistry. *Prep. 12.841.*

12.843 Advanced Inorganic Chemistry III

Crystal symmetry. Introduction to theory of lokids; semi-conductors and metals; non-stoichiometric compounds; solid state reactions. Application of molecular orbital theory. Determination of electron distribution in transition metal compounds. Mössbauer spectroscopy and advanced magneto-chemistry. *Prep. 12.842 and 12.885.*

12.846 Coordination Chemistry

Solution phase properties of coordination compounds. Experimental methods for the study of thermodynamics stability and kinetic lability. Kinetics and mechanism of sol-

vent exchange and substitution reactions at transition metal centers. Classification of redox reaction mechanisms. Marcus theory. Phenomenological mechanisms. *Prep.* 12.843.

12.847, 12.848, 12.849, 12.850 Special Topics in Inorganic Chemistry I, II, III, IV

Advanced topics of importance in inorganic chemistry including: Advanced Ligand Field Theory: Crystal field theory of ions in weak and strong fields. Molecular orbital theory of transition metal complexes. Crystal Structure Determination in Solids: Crystallography, X-ray, electron and neutron diffraction techniques applied to inorganic, bio-inorganic and other solids. Resonance Spectroscopy in Inorganic Chemistry: Electron spin resonance, nuclear magnetic resonance, nuclear quadrupole resonance and Mössbauer Spectroscopy. Solid State Chemistry: Thermal, magnetic and transport properties; phase transformations and crystal defects; surface effects; material preparation techniques. *Prep.* 12.842 and consent of instructor.

12.861, 12.862 Advanced Organic Chemistry I, II

An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material. *Prep.* One year of Organic Chemistry.

12.863 Physical Organic Chemistry

Topics in basic physical organic chemistry: molecular polarity, equilibrium and kinetics, reactivity and structure, solvent effects, acid-base catalysis, orbital symmetry, aromaticity. *Prep.* 12.862 or consent of instructor.

12.864, 12.865 Organic Stereochemistry and Reaction Mechanisms I, II

Interrelations of the stereochemistry of organic molecules with their physical and chemical behavior. Conformational analysis. The effects of spatial relationships on transition states, equilibria and reaction rates as an introduction to the study of organic reaction mechanisms. *Prep.* 12.863.

12.866 Spectrometric Identification of Organic Compounds

Interpretation of the ultraviolet, infrared and nuclear magnetic resonance spectra of organic compounds. *Prep.* One year of Organic Chemistry.

12.871, 12.872, 12.873 Special Topics in Organic Chemistry I, II, III

Selected topics of current importance in organic chemistry. *Prep.* 12.862 and consent of instructor.

12.876, 12.877 Organic Reaction Mechanisms and Organic Synthesis I, II

The fundamental factors influencing the courses of organic reactions. Substitution reactions. Pericyclic reactions. Synthetic methods as an introduction to organic synthesis. *Prep.* 12.865 or concurrent registration therein.

12.881 Chemical Thermodynamics I

First Law of Thermodynamics, Thermochemistry, Second and Third Laws, Free Energies, Reaction and Phase Equilibria. *Prep.* consent of instructor.

12.882 Chemical Thermodynamics II

Partial Molar Properties, Solutions, Electrolytes. Statistical Analogues of Entropy and Free Energy, Partition Functions. *Prep.* 12.881.

12.883 Chemical Thermodynamics III

Statistical Thermodynamics applied to gases, liquids and solids. Irreversible Thermodynamics. *Prep. 12.882 and 12.886.*

12.885 Introductory Quantum Chemistry I

Introduction to quantum mechanics. Application to simple systems. Perturbation theory and applications. Harmonic oscillator, rigid rotor and applications to microwave and infrared spectroscopy. Simple atoms. *Prep. One year of Physical Chemistry.*

12.886 Introductory Quantum Chemistry II

The variational method. The chemical bond. H_2^+ . The LCAO method. Group theory and applications. Molecules. Woodward-Hoffman rules. *Prep. 12.885.*

12.887 Introductory Quantum Chemistry III

Application of group theory and simple approximate theories to conjugated molecules. The SCF method and its application to atoms and molecules. Applications to molecular spectroscopy. *Prep. 12.886.*

12.890, 12.891, 12.892 Special Topics in Physical Chemistry I, II, III

Advanced topics of importance in physical chemistry including: Quantum Chemistry: Linear algebra and the formulation of quantum theory. Angular momentum. Group theory. Small molecules. Time-dependent theory and selected advanced topics. Statistical Mechanics: Quantum statistics; electrons in metals, photons and phonons; superconductivity; fluctuations, noise and irreversible thermodynamics; transport phenomena; phase transitions of high order. *Prep. consent of instructor.*

12.893 Chemical Kinetics

Use of experimental data to deduce the rate law of a reaction. Mechanisms deduced from rate laws. Influence of experimental error on precision of rate constants and activation energies. Collision and transition state theories of reaction rates. *Prep. One year of physical chemistry.*

12.901 Polymer Chemistry I

Introduction to polymers. Major emphasis on synthesis. Step-reaction, chain-reaction, and ring-opening polymerizations. Copolymerization. Three-dimensional polymers and crosslinking. *Prep. One year of Organic Chemistry and one year of Physical Chemistry.*

12.902 Polymer Chemistry II

Physical chemistry of polymers in solution and bulk. Molecular characterization. Mechanical and physical properties in the glassy, rubbery, viscous, and semi-crystalline states. *Prep. 12.901.*

12.903 Polymer Chemistry III

Industrial practice. Polymer processing. Fibers. Elastomers. Coatings. Adhesives. Reinforced plastics. Relationship of polymer structure to usage. *Prep. 12.902.*

12.910 Special Projects in Chemistry

Laboratory studies on a topic not directly related to research pursued for a thesis. *Prep. Permission of the departmental faculty is required.*

12.990 Seminar (1 q.h.)

Oral reports by the participants on current investigations in chemistry. *Prep. Enrollment in full-time program.*

12.991 Research and Thesis for M.S. (maximum: 14 q.h.)

Original research and a written thesis thereon, under supervision of a faculty member.

12.995 Research and Dissertation for Ph.D.

Original research in depth, representing a significant contribution of new chemical knowledge, and a written dissertation thereon, under the supervision of a faculty member.

90.821 Biochemistry I

Discussion of the structures and chemistries of carbohydrates, proteins, lipids, nucleic acids, and selected cofactors. *Prep. One year organic chemistry.*

90.822 Biochemistry II

Bioenergetics, enzymes and enzyme kinetics, intermediary metabolism including carbohydrate catabolism, tricarboxylic acid cycle, electron transport, and oxidative phosphorylation. *Prep. Biochemistry I, 90.821.*

90.823 Biochemistry III

Continuation of intermediary metabolism from Biochemistry II, including lipid, protein, and nucleic acid metabolism, photosynthesis and cell regulation. *Prep. Biochemistry II, 90.822.*

See the catalog of the Graduate School of Pharmacy and Allied Health Professions for other courses on chemical topics.

clinical chemistry

MASTER OF SCIENCE IN CLINICAL CHEMISTRY

Part-Time Program

Admission

In addition to the admissions requirements listed on page 14, the applicant must have completed a baccalaureate program in biology, chemistry, medical technology, or pharmacy. Undergraduate requirements in this program are a minimum of two quarters of organic chemistry, two quarters of analytical chemistry (each with a laboratory or its equivalent), two

quarters of human physiology, and two quarters of physical chemistry. An individual who has deficiencies in any of these areas may take appropriate evening courses at Northeastern University concurrently with those graduate courses which do not require the deficient prerequisites. The appropriate evening courses offered at University College of Northeastern University are: Analytical Chemistry 12.421-12.423 or 12.427; Organic Chemistry 12.431-12.433; Physical Chemistry 12.441-12.443; and Human Anatomy and Physiology 18.424-18.426. Equivalent courses from this university or other universities will be accepted.

This is an interdisciplinary program and applications should be directed to the Graduate School of Pharmacy and Allied Health Professions.

Program

The Master of Science in Clinical Chemistry is an interdisciplinary program with the College of Pharmacy and Allied Health Professions. Forty quarter hours of academic coursework are required. In addition, a student must have at least one year of acceptable clinical laboratory experience prior to completion of academic degree requirements. Students in good standing in the program who lack this experience requirement may apply for the course 87.167 Clinical Chemistry Applied Study (carries 5 q.h. of undergraduate credit, 2 q.h. of which may be applied toward the master's degree). This course is offered through the College of Pharmacy and Allied Health Professions of Northeastern University at one of the nearby affiliated hospitals, and provides three months of this experience requirement. Individuals who have completed this course may achieve an enhanced opportunity to obtain subsequent employment in this field and thereby satisfy the one year of experience requirement.

The program is available on a part-time basis with courses offered primarily during the evening hours. Courses are scheduled in the Fall, Winter, Spring, and Summer Quarters. The following are core courses required in the program:

	Total Credits
10.8H3 Biostatics	2
12.821 Analytical Separations	2
12.823 Optical Methods of Analysis	2
72.834 Advanced Clinical Chemistry I	2
72.835 Advanced Clinical Chemistry II	2
72.837 Seminar and Report in Clinical Chemistry I	2
73.845 Radioisotopes in Biological Systems	2
87.810 Functions of Human Systems	2
90.821 Biochemistry I	2
90.822 Biochemistry II	2
90.823 Biochemistry III	2
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Twelve additional credits must be taken from the following elective core courses:

	Credits
12.822 Electroanalytical Chemistry	2
12.824 Special Topics in Analytical Chemistry I	2
12.825 Special Topics in Analytical Chemistry II	2
12.829 Computers in Chemistry	3
72.825 Special Topics in Clinical Chemistry	2
72.838 Seminar and Report in Clinical Chemistry II	2
72.839 Seminar and Report in Clinical Chemistry III	2
72.861 Advanced Medicinal Chemistry I	2
72.862 Advanced Medicinal Chemistry II	2
72.863 Advanced Medicinal Chemistry III	2
72.864 Advanced Medicinal Chemistry IV	2
72.865 Special Topics in Medicinal Chemistry	2
73.814 Concepts in Pharmacology I	2
73.815 Concepts in Pharmacology II	2
73.816 Concepts in Toxicology I	2
73.817 Concepts in Toxicology II	2
73.844 Drug Metabolism	2
87.811 Pathophysiology I	2
87.812 Pathophysiology II	2
87.833 Immunobiology	2
87.890 Seminar	1
90.824 Applications of Mass Spectrometry	2

Taken with the approval of the Director of the M.S. program in Clinical Chemistry and the course instructor, selection may be made from the above courses as well as the following and other appropriate graduate courses in the University.

	Credits
11.871 Radiation Physics	2
11.872 Radiobiology	2
12.841 Inorganic Chemistry I	2
12.842 Inorganic Chemistry II	2
12.846 Coordination Chemistry	2
12.861 Advanced Organic Chemistry I	2
12.862 Advanced Organic Chemistry II	2
12.863 Physical Organic Chemistry	2
12.866 Spectrometric Identification of Compounds	2
12.881 Thermodynamics I	2
12.885 Atomic and Molecular Structure I	2
12.893 Kinetics	2
18.245 Serology-Immunology	3
18.840 Comparative Physiology of Regulatory Mechanisms	2
18.842 Vertebrate Endocrinology	2
18.843 Procedures in Endocrinology	3
18.860 Cell Biophysics and Biochemistry	5
18.909 Animal Virology	4
18.940 Microbial Biochemistry	4
72.815 Nuclear Medicine I	2

72.816	Nuclear Medicine II	2
72.817	Nuclear Medicine III	2
72.818	Nuclear Medicine IV	2
72.844	Seminar and Research Report in Radiopharmaceutical Science	2
72.866	Phytochemistry	2
72.880	Cardiovascular Drugs	2
73.818	Special Topics in Pharmacology	2

DESCRIPTION OF COURSES

All courses carry two quarter hours of credit unless otherwise indicated.

Courses with the prefix number 12 are chemistry offerings. Their descriptions may be found in the preceding section of this bulletin along with interdisciplinary biochemistry courses (prefix number 90).

72.825 Special Topics in Clinical Chemistry

Each year a recent special topic of general interest in clinical chemistry is selected for this course. *Offered yearly, winter quarter.*

72.834 Advanced Clinical Chemistry I

Principles, instrumentation, methodology, and interpretations in clinical chemistry. *Prep. 90.823.*

72.835 Advanced Clinical Chemistry II

A continuation of Clinical Chemistry I. *Prep. 72.834.*

72.837, 72.838, 72.839 Seminar and Report in Clinical Chemistry I, II, III

Reports and discussions of current journal articles in clinical chemistry. *Prep. 72.835.*

72.861 Advanced Medicinal Chemistry I

Presentation and discussion of the chemistry, structure-activity relationships, and mechanism of action of general anesthetics, hypnotics and sedatives, anti-epileptics, analgetics, tranquilizers, and muscle relaxants. A consideration of the mechanics of drug design and methods of modification will be undertaken. *Prep. Two quarters of Organic Chemistry. Offered alternate years.*

72.862 Advanced Medicinal Chemistry II

A discussion of drugs acting on the central nervous system with a special emphasis on the mechanism of action of the chemical mediators of the peripheral nervous system. The role of agents affecting this system—adrenergic and cholinergic and reversible and irreversible inhibitors of these systems will be discussed in relation to their chemical structure and biological activity. *Prep. Two semesters of Organic Chemistry. Offered alternate years.*

72.863 Advanced Medicinal Chemistry III

A study of the various chemotherapeutic agents employed in the treatment of infectious diseases. Included will be the sulfonamides, antibiotics, antivirals, antitubercular, antifungal, and antimalarial agents. Special emphasis will be on structure-activity relationships, mechanisms of action, and modern research in each area. *Prep. Two quarters of Organic Chemistry. Offered alternate years.*

72.864 Advanced Medicinal Chemistry IV

Recent developments in new approaches to the treatment of cancer from a chemotherapeutic standpoint will be considered: including alkylating agents, anti-metabolites, hormones, and miscellaneous compounds, and combinations of the above with radiation and immunology. Possible mechanisms of action will be explored. *Prep. Two quarters of Organic Chemistry. Offered alternate years.*

72.865 Special Topics in Medicinal Chemistry

A consideration of a special area of medicinal chemistry including either CNS compounds, pharmacodynamic agents or chemotherapeutics; their chemistry and structure-activity relationships will be presented. *Prep. Two quarters of Organic Chemistry. Offered alternate years.*

72.866 Phytochemistry

The important classes of chemical compounds produced by plants considered from the standpoint of their biogenetic origin, methods for their detection, isolation and characterization; application of these techniques to research in pharmacy, medicine, economic botany, taxonomy; and introduction to the literature of plant chemistry. *Prep. Two quarters of Organic Chemistry, two quarters of Biology. Offered alternate years.*

72.880 Cardiovascular Drugs

The course will be aimed so as to expose the students to current ideas and developments in the area of cardiovascular drug research. Lectures will emphasize the latest concepts regarding the etiology and pathophysiology of cardiovascular disorders and the proposed mechanism of drug action. *Prep. 73.814 Concepts in Pharmacology I. Offered yearly, fall quarter.*

73.816 Concepts in Toxicology I

Concepts of modern toxicology in which emphasis is placed on biochemical mechanism underlying the toxicological action of drugs and other chemical substances upon biological systems. Selected topics in toxicology including acute, sub-acute, and chronic effects of drugs in the experimental animal and man. Consideration of the predictive value of animal studies for drug effects in man. *Prep. Permission of instructor. Offered alternate years.*

73.817 Concepts in Toxicology II

Continuation of Concepts in Toxicology I. *Prep. 73.816. Offered alternate years.*

73.844 Drug Metabolism

Presentation of detoxication mechanisms relating to drug metabolism and excretion patterns; adaptive factors influencing metabolism; methodology of radioactive nuclides and application of these isotopes to biology and medicine with special emphasis on their use in clinical analysis.

73.845 Radioisotopes in Biological Systems

Methodology of radioactive nuclides and application of these isotopes to biology and medicine with special emphasis on their use in clinical analysis.

Other biology, chemistry, and pharmacy courses may be taken with the approval of the admissions committee and the course instructor.

forensic chemistry

INTERDISCIPLINARY PH.D. PROGRAM IN FORENSIC CHEMISTRY

This program is being offered in conjunction with the College of Criminal Justice and Northeastern University's Institute of Chemical Analysis, Applications and Forensic Science. This unique program is designed to provide the opportunity for preparation for research and leadership positions in forensic laboratories. The Chemistry Department is the registering department for two of the three specializations of this program, namely, forensic analytical chemistry and forensic materials science; a third specialization, forensic toxicology, is administered by the College of Pharmacy, again in connection with the College of Criminal Justice. Admission is made through the registering department.

For students entering with a B.S., completion of the M.S. course requirements in Forensic Chemistry (described below, page 59) with a B average is required to qualify for further Ph.D. study. For students with M.S. degrees in forensic science or the natural sciences, individual programs are planned according to the student's background. The course of study includes comprehensive examinations, thesis research to be carried out at the Institute of Chemical Analysis, Applications and Forensic Science and an internship at a major forensic laboratory engaged in research. Application material can be obtained by writing to:

Graduate Program in Forensic Chemistry
Institute of Chemical Analysis, Applications and Forensic Science
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115

MASTER OF SCIENCE IN FORENSIC CHEMISTRY Full-Time and Part-Time Program

Admission

In addition to the admissions requirements listed on page 14, the applicant must have completed a baccalaureate degree in the physical or life sciences. Undergraduate courses must include general chemistry, organic chemistry, analytical chemistry, physics, thermodynamics and calculus. An individual who has deficiencies in any of these areas may take the appropriate courses at Northeastern University concurrently with those

graduate courses which do not require the deficient prerequisites. Although they are not prerequisites for the program, courses in general biology, botany, physical chemistry, microbiology and computer science are desirable. Application material can be obtained by writing to:

Graduate Program in Forensic Chemistry
 Institute of Chemical Analysis, Applications and Forensic Science
 Northeastern University
 360 Huntington Avenue
 Boston, Massachusetts 02115

Program

The Master of Science in Forensic Chemistry is an interdisciplinary program involving cooperation among the College of Liberal Arts, the College of Criminal Justice, and the Institute of Chemical Analysis, Applications and Forensic Science. Forty-two quarter hours of academic graduate coursework are required, including a Master's paper. In addition, a three-months internship consisting of full-time work in an approved, practicing forensic laboratory is required. The full-time program will thus generally encompass five quarters; this may be reduced to four quarters if the student can demonstrate to the satisfaction of the program committee the prior completion of three months or more of equivalent forensic laboratory experience. The program is available on a full-time or part-time basis; courses are offered primarily during the evening hours. Graduate courses are scheduled in the fall, winter, and spring quarters. The following are core courses required in the program.

Required Courses		Credits
12.810	Modern Methods of Analysis	3
73.814	Concepts in Pharmacology I	2
10.8H3	Biostatistics	2
90.821	Biochemistry I	2
92.824	Legal Aspects of Forensic Science	3
92.904	Administration of Criminal Justice	3
92.921	Arson and Explosives	3
92.931	Crime Scene Investigation	3
93.950	Forensic Materials	2
93.951	Forensic Chemistry Techniques I	4
93.952	Forensic Chemistry Techniques II	4
93.953	Seminar	1
93.954	Master of Science Paper	4

Six additional credits must be taken from the following list of elective courses.

2.970	Material Science and Engineering	2
2.971	Material Science and Engineering	2
12.821	Analytical Separations	2
12.822	Electroanalytical Chemistry	2
12.823	Optical Methods of Analysis	2
12.824	Special Topics of Analytical Chemistry I	2
12.825	Special Topics of Analytical Chemistry II	2
12.826	Special Topics of Analytical Chemistry III	2
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Physical Organic Chemistry	2
12.866	Spectrometric Identification of Organic Compounds	2
12.901	Polymer Chemistry I	2
12.902	Polymer Chemistry II	2
12.903	Polymer Chemistry III	2
72.834	Advanced Clinical Chemistry I	2
72.835	Advanced Clinical Chemistry II	2
72.861	Advanced Medicinal Chemistry I	2
72.862	Advanced Medicinal Chemistry II	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.844	Drug Metabolism	2
90.822	Biochemistry II	2
90.823	Biochemistry III	2
92.913	Criminal Justice Planning and Development	3
92.841	Criminal Law	3
93.956	Directed Study in Forensic Chemistry	2
93.957	Directed Study in Forensic Chemistry	3

economics

Professors

Morris A. Horowitz, Ph.D., Harvard University, Chairperson
Harold M. Goldstein, Ph.D., Clark University
Irwin L. Herrnsstadt, Ph.D., Massachusetts Institute of Technology
Sungwoo Kim, Ph.D., University of California, Berkeley
Peggy Musgrave, Ph.D., Johns Hopkins University
Gustav Schachter, Ph.D., New York University
Donald Shelby, Ph.D., University of California, Berkeley

Associate Professors

Conrad P. Caligaris, Ph.D., Brown University
Ernest M. DeCicco, Ph.D., Boston University
Daryl A. Hellman, Ph.D., Rutgers University
Pawan K. Sawhney, Ph.D., Boston University

Assistant Professors

Philip Abbott, Ph.D., Massachusetts Institute of Technology
Sharda Gupta, Ph.D., Purdue University
Yudhishter L. Mahajan, Ph.D., Northern Illinois University
Francis Mulvey, Ph.D., Washington State University
Joel Naroff, Ph.D., Brown University
Andrew Sum, M.A., Massachusetts Institute of Technology

The Economics Department offers four terminal programs with different admission requirements and program form and content in an effort to serve students with varying backgrounds, interests, and goals. These programs are: a non-degree certificate program, an M.S. degree program in economic policy and planning, an M.A. degree program with specialization in one of four available fields, and a doctoral degree program.

CERTIFICATE PROGRAM

The Economics Department offers a non-degree program in the Economics of Manpower and Development Planning. Upon completion of the prescribed program, students will receive a certificate issued by the Graduate School of Arts and Sciences, Northeastern University. The program is designed for students interested in a specialized program of courses in manpower and development planning but who do not wish to meet the requirements of a degree program.

Admission

Admission to the program will be considered for graduates of recognized universities or institutes of technology, although practical experience in

manpower planning or development planning may be substituted for the admission requirements at the discretion of the faculty. All foreign students must submit a TOEFL test score or an equivalent certification of the applicant's proficiency in English along with the application and academic transcripts.

Program

This certificate program is designed to be completed in one year. Students admitted to the program may not transfer into the regular degree programs. Evidence of completion of a course and of the program shall be attendance, all required reading, and all written work. Successful completion of a course shall be noted by a pass designation.

Fall Quarter (All four courses required)

- 39.9F4 Introductory Macroeconomic Theory
- 39.9F3 Introductory Microeconomic Theory
- 39.9G1 Economics of the Labor Market
- 39.9P1 Economic Development

Winter Quarter (Select any two of three electives listed)

- 39.250 Statistics (Required)
- 39.9G4 Manpower Planning I (Elective)
- 39.9P3 Regional Development (Elective)
- 39.9Q1 Development Finance (Elective)

Spring Quarter (Select any three of four courses listed)

- 39.9J1 Seminar in Human Resource Development
- 39.9R1 Seminar in Development Planning
- 39.9G5 Manpower Planning II
- 39.9P6 Comparative Economic Development

Variations in this basic program are possible only with prior approval of the Graduate Director.

THE MASTER OF SCIENCE DEGREE IN ECONOMIC POLICY AND PLANNING

Forty-one quarter hours of academic work are required. The program consists of 20 quarter hours of required courses and 21 quarter hours of electives. With the approval of the program adviser, a student may select a maximum of 9 quarter hours from graduate courses offered by other departments. This is a terminal degree program designed mainly for working economists, government agency officials, and middle echelon employees in the private sector.

Admission

Applicants must meet the general admission regulations of the Graduate School of Arts and Sciences.

Comprehensive Examination

After completion of courses, a comprehensive examination is required of all students to test their ability to apply concepts and tools in the broad field of economic policy and planning. The examination may be repeated only once.

Master's Thesis

A master's thesis for a maximum of six quarter hours of credit is optional, with the approval of the program adviser.

Course Requirements

A. Required Core Courses

	Q.H. Credits
39.9F5 Introduction to Statistics	4
39.9F1 Economic Policy and Planning I	4
39.9F2 Economic Policy and Planning II	4
39.9F3 Introductory Microeconomic Theory	4
39.9F4 Introductory Macroeconomic Theory	4

B. Elective Courses

A total of twenty-one hours of electives (12 of which must be economics courses) may be selected by the student in accordance with interests and needs. Electives may be concentrated in any of the available areas or may be distributed among fields to obtain a broader exposure. All economics electives are 3 quarter hour credits. A maximum of 6 credits for courses taken at other institutions may be accepted if taken during the past 7 years.

THE MASTER OF ARTS DEGREE

Forty quarter hours of academic work are required. This program comprises 16 quarter hours of required core course work and 24 quarter hours of electives of which a minimum of twelve quarter hours must be selected from one of the economic fields listed below. The required core courses must be completed as soon as possible. With the approval of the graduate adviser, a student may select a maximum of six quarter hours from graduate courses offered by other departments, or two advanced undergraduate courses in economics carrying three quarter hours of graduate credit.

Admission

In addition to the general admission requirements of the Graduate School of Arts and Sciences, applicants should have had a minimum of 12 semester hours of economics, or the equivalent, of which three semester hours, or the equivalent, should be statistics. Admission is only possible in the Fall and Winter Quarters. Application for admission to the Fall Quarter will be given consideration if received by August 31. Applications for admission to the Winter Quarter will be given consideration if received by November 30.

Applications for financial aid should be submitted no later than March 15. See page 24 for information on financial aid available.

Comprehensive Examination

A comprehensive examination, which will be held in accordance with the general graduate school regulations, must be taken by all students during the quarter in which the student completes the 40 quarter hours of academic work. The examination may be repeated only once.

Master's Thesis

A master's thesis for six quarter hours of credit is optional with the approval of the graduate adviser. Approval will be granted only in those instances in which previous graduate work of the student indicates capacity for independent study.

Required Core Courses*

The required core courses are:

	Credits
39.9A1 Microeconomic Theory**	4
39.9B1 Macroeconomic Theory**	4
39.9E1 Statistical Inference***	4
39.9E7 Econometrics I	4

Economic Fields

Available economic fields are listed below. Under each field are stated the required field courses and the elective field courses. Students must take at least twelve quarter hours in one field of concentration. In all fields the first listed required course in the field ordinarily should be taken first by the student majoring in the field. For students not majoring in the field, courses in the field may be taken in any sequence.

Manpower Economics

Required field courses:

- 39.9G1 Economics of the Labor Market and Labor Force
- 39.9G4 Economics of Manpower Planning I
- 39.9J1 Seminar in Human Resource Development

* Students must demonstrate competence in mathematics by taking a mathematics examination given by the department during registration week prior to the start of the Fall Term. Students must pass this exam or register for 39.9D0.

**Candidates deficient in intermediate theory may not be admitted into these core courses until they have completed 39.9A0 and/or 39.9B0.

*** Students may meet the prerequisite of this course by passing a statistics examination given by the department during registration week prior to the start of the fall term or by taking 39.9E0.

Elective field courses:

- 39.9G5 Economics of Manpower Planning II
- 39.9G7 Human Resources and Labor Problems and Policies
- 39.9H1 Economics of Medical Care and Health Manpower
- 39.9H3 Economics of Education

Urban/Regional Economics**Required field courses:**

- 39.9K1 Regional Economics
- 39.9L1 Urban Economics I
- 39.9L2 Urban Economics II

Elective field courses:

- 39.9M1 Intergovernmental Fiscal Relations
- 39.9P3 Regional Development

Development Economics**Required field courses:**

- 39.9P1 Economic Development
- 39.9P3 Regional Development
- 39.9R1 Seminar in Development Planning

Elective field courses:

- 39.9P6 Comparative Economic Development
- 39.9Q1 Development Finance
- 39.9G4 Economics of Manpower Planning I
- 39.9K1 Regional Economics

Economics of Money and Finance**Required field courses:**

- 39.9S1 Monetary Theory
- 39.9S3 Monetary Policy
- 39.9V1 Seminar in Money and Finance

Elective field courses:

- 39.9T1 Public Policy and Finance
- 39.9T5 Capital Markets
- 39.9Q1 Development Finance
- 39.9M1 Intergovernmental Fiscal Relations

THE DOCTOR OF PHILOSOPHY DEGREE

The doctoral degree program in economics is offered in the fields of manpower, urban-regional, development, and monetary economics.

Admission

Applicants who will have a master's degree in economics or its equivalent at entry may be considered for direct admission to the doctoral program.

Applicants who will not have a master's degree in economics or its equivalent at entry may apply for admission to the doctoral program after the satisfactory completion of 40 quarter hours of graduate work.

Admission to the doctoral program is possible only in the Fall Quarter. Applications for the doctoral program must be submitted no later than March 15.

Residence Requirement

After acceptance to the doctoral program, the student may satisfy the residence requirement by one year of full-time graduate course work. Teaching assistants may satisfy the residence requirement by two consecutive years of half-time graduate course work. A student should expect to spend at least two academic years in full-time study, or its equivalent, completing the requirements for the doctoral degree.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Course Requirements

A. At least 32 quarter hours of graduate work beyond the master's degree are required. These include:

Required Core Courses:

- 39.9A2 Microeconomics II
- 39.9B2 Macroeconomics II
- 39.9D1 Mathematics for Economists
- 39.9E8 Econometrics II

B. Concentration in one academic field. Course work in the field must include the doctoral seminar sequence 39.9C1 and 39.9C2. This seminar has a prerequisite of 12 quarter hours of graduate course work in the field.

Qualifying Exam

Each student must pass comprehensive qualifying examinations after the completion of the required core and field courses. These exams are: (1) a two-hour written exam in macroeconomic theory; (2) a two-hour written exam in microeconomic theory; (3) a two-hour written exam in quantitative methodology; (4) a three-hour written exam in one doctoral field; and (5) a two-hour general oral exam. Passing the qualifying exams signifies that the student has completed all course requirements and can now devote all the time to the dissertation. An examination may be repeated only once.

Doctoral Dissertation

An original doctoral dissertation is required of all students in accordance with the general graduate school regulations and the regulations estab-

lished by the department. After the successful completion of the qualifying examination, students shall work with dissertation advisers under whose guidance they will write the doctoral dissertation. The dissertation adviser serves as chairperson of the dissertation committee which must approve the dissertation before the degree may be conferred.

Final Oral Examination

The final oral examination will be established in accordance with the general graduate school regulations.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

Courses indicating microeconomic theory as a prerequisite refer to 39.9F3 for M.S. degree students and 39.9A1 for M.A. degree students.

Courses indicating macroeconomic theory as a prerequisite refer to 39.9F4 for M.S. degree students and 39.9B1 for M.A. degree students.

39.9A0 Introduction to Intermediate Microeconomic Theory

Intensive coverage of basic micro theory. This course is designed for M.A. degree students who need to improve their background in micro theory and carries no academic credit toward the M.A. or Ph.D. programs.

39.9A1 Microeconomic Theory I (4 q.h.)

A non-math treatment of microeconomic theory at the beginning graduate level. An investigation of the conditions underlying consumer and producer equilibrium under different objective functions and various market structures. Derivation of product demand curves, supply curves, and factor demand curves for alternative market structures in product and factor markets are surveyed.

39.9A2 Microeconomic Theory II (4 q.h.)

An examination of contemporary microeconomic problems and theory with specific emphasis on welfare economics, general equilibrium, distribution, the theory of the firm, and the ability of modern value theory to reach meaningful and feasible policy conclusions. *Prep. 39.9A1 and consent of instructor.*

39.9B0 Introduction to Intermediate Macroeconomic Theory

Intensive coverage of basic macro theory. This course is designed for M.A. degree students who need to improve their background in macro theory and carries no academic credit toward the M.A. or Ph.D. programs.

39.9B1 Macroeconomic Theory I (4 q.h.)

Income and employment theory; classical, Keynesian, and post-Keynesian aggregate demand and supply systems.

39.9B2 Macroeconomic Theory II (4 q.h.)

Theory and problems of macro-dynamics, growth, inflation, cycles, and stabilization policy. *Prep. 39.9B1 and consent of instructor.*

39.9C1 Doctoral Research Seminar I (4 q.h.)

Prep. 12 q.h. of field work and consent of instructor.

39.9C2 Doctoral Research Seminar II (4 q.h.)

Prep. 39.9C1.

39.9D0 Introduction to Mathematics for Economists (4 q.h.)

This course acquaints the student with the algebra and elementary calculus necessary for quantitative economics: simultaneous linear systems; polynomial, logarithmic, and exponential functions; and elementary differential and integral calculus.

This course offers no credit toward a degree in economics.

39.9D1 Mathematics for Economics (4 q.h.)

Application of matrix algebra and simple multivariate calculus to economic analysis. Static organization and dynamic analysis, difference and differential equations. Examples from economic theory. *Prep. 39.9D0 or mathematics examination.*

39.9E0 Introduction to Statistics (4 q.h.)

An introduction to statistical methods and techniques used in economic analysis. Descriptive statistics, time series and index number problems, sampling problems, introduction to probability theory and hypothesis testing. This course is designed for M.A. degree students who need to improve their background in basic statistics and carries no academic credit toward the M.A. or Ph.D. programs.

39.9E1 Statistical Inference (4 q.h.)

A study of statistical methods and techniques. Probability theory and models, testing economic hypotheses, analysis of variance, ordinary least squares regression, t-statistics and f-statistics. Correlation analysis. *Prep. 39.9E0 or equivalent.*

39.9E5 Economic Programming

Economic programming with emphasis on linear programming, including the transportation and simple problems, and simulation and queuing theory with applications to the computer. *Prep. 39.9D1.*

5.913 Data Processing

A study of digital computers and computer programming techniques. The FORTRAN language is utilized for programming and running several projects.

39.9F1 Seminar In Economic Policy and Planning I (4 q.h.)

Students are required to participate in a project in their own field of interest, covering such issues as metropolitan and regional job creation policies, budget analysis, evaluation of public programs and the role of private and public sectors in regional development. Techniques for planning such as construction and use of data banks, application of input-output analysis, industrial location analysis and social benefit-cost analysis are covered. The role of agencies in the organization and implementation of programs and plans are examined. *Prep. 39.9F3, 39.9F4, 39.9F5 co-requisite.*

39.9F2 Seminar In Economic Policy and Planning II (4 q.h.)

Prep. 39.9F1.

39.9F3 Introduction to Intermediate Microeconomic Theory (4 q.h.)

Intensive coverage of basic micro theory. This course is limited to students in the M.S. degree program.

39.9F4 Introduction to Intermediate Macroeconomic Theory (4 q.h.)

Intensive coverage of basic macro theory. This course is limited to students in the M.S. degree program.

39.9F5 Introduction to Statistics (4 q.h.)

Intensive coverage of descriptive statistics. This course is limited to students in the M.S. degree program.

39.9F7 Introduction to Mathematics for Economists (4 q.h.)

Intensive coverage of basic math. This course is limited to students in the M.S. degree program.

39.9G1 Economics of the Labor Market and Labor Force

Labor force measurement and determinants, changing labor market role of women; micro-analysis of labor supply and demand, varieties of labor markets and their functioning; minimum wages; wage structures and differentials, labor allocation and migration; union impact on wage levels and structures; macro-wage-employment determination, macro-wage-price problems, income policies. Applications to developing and developed economies.

39.9G4 Economics of Manpower Planning I

The role of manpower planning and its integration with general development planning. Analysis and evaluation of different techniques of manpower planning. Technological versus economic methods. Practice of manpower forecasting and data problems. Skill training versus educational strategies. Models of educational planning and their applications to different countries. *Prep. Microeconomic Theory.*

39.9G5 Economics of Manpower Planning II

Applications of manpower planning methods and techniques to problems of national economic development. Cost-benefit and cost-effectiveness of educational and manpower programs. Special problems of health manpower, scientists, engineers, and technicians. Evaluation of methods and prediction used in national manpower plans. *Prep. 39.9G4.*

39.9G7 Human Resources and Labor Problems and Policies

Unemployment and underemployment, technological change and changing skill requirements; income distribution and poverty; human capital theories and human resource development; employment and training policies to raise personal earnings, income maintenance programs. Topics discussed in relation to developing and developed economies.

39.9H1 Economics of Medical Care and Health Manpower

The organization of medical care, the problems associated with various alternative delivery systems, the utilization and availability of physicians and other categories of paramedical personnel, the growth and pressures exerted by third party payers; and consideration of federal, state, and municipal participation in the delivery of quality medical care under various alternatives for national health insurance.

39.9H3 Economics of Education

An examination of the contribution of education to the process of economic growth and the way education is produced and distributed. Special topics to include: inequalities in returns to education; the role of intelligence and class background in educational success; and socializing role of education in production.

39.9J1 Seminar in Human Resource Development

Selected topics on the development and use of human resources. *Prep. Consent of instructor.*

39.9K1 Regional Economics

Delineating regions. Theories of location for firms, industries, and people. Regional income accounting systems, and models of intra- and inter-regional income determinants and impact analysis. *Prep. Microeconomic Theory.*

39.9K4 Externalities

Theoretical foundations for urban and regional economics. Survey of economic theory related to externalities and welfare economics. *Prep. 39.9A1 and consent of instructor.*

39.9K5 Economics of Crime

A discussion of the resource allocation problem as it relates to criminal behavior and effective law enforcement. Evaluation of costs and benefits of alternative law enforcement policies. Criminal activity, including organized crime, will be analyzed in an economic context.

39.9L1 Urban Economics I

The economy of cities. Analysis of intra-metropolitan spatial relationships including residential location, land and housing markets. *Prep. Microeconomic Theory.*

39.9L2 Urban Economics II

Continuation of Urban Economics I. Problems in urban economics including segregation, housing, transportation, urban renewal, and related policy issues. *Prep. 39.9L1.*

39.9L5 Economics of Urban Transportation

Urban agglomeration, economic activities, residential concentration and transportation network; urban and suburban densities in relation to the central place; capital budgeting; pricing; costs incidence and externalities of various modes; cost-benefit analysis; effects of transportation patterns on urban socio-economic life; modal split and forecasting economic requirements for integrated urban transport needs.

39.9L7 Economics of Inter-City Transportation

Investigates the rationale for intercity freight and passenger movements within the framework of interregional commodity flows. The choice of mode once traffic volume has been determined. The economic and environmental impacts of the choice of mode are studied.

39.9M1 Intergovernmental Fiscal Relations

A study of the development of the federal system, interstate and interarea fiscal comparisons, grants-in-aid, tax credits, revenue sharing, state and local taxes, non-tax

revenues, borrowing and budgeting at the state and local level, and a discussion of the process and prospects of state and municipal equalization of tax burden and effort. *Prep. Microeconomic Theory.*

39.9N1 Seminar in Urban/Regional Economics

Selected topics in urban/regional economics. *Prep. Consent of instructor.*

39.9P1 Economic Development

A study of the prospects of economic growth in less developed areas. Measurement and theories of economic development. Role of human and natural resources, education, technology, and capital formation in national, regional, and sectoral development. Changes in institutions.

39.9P3 Regional Development

Intra-regional dynamics, dualism, and spontaneous polarization. Growth poles, dispersion, and spread effect; inter-regional factor migration and social cost; regional structural change and dynamic analysis; public policies and planning; socio-economic variables and measurements; feasibility and simulation in shortrun analysis. Examples of regions at county, province, state and "area" level; differentiation between political and economic boundaries; bootstrapping vs. outside source approach. Application of the FS and UN multiregional models.

39.9P6 Comparative Economic Development

Comparison of economic systems in differing stages of economic development as exemplified by Yugoslavia, Southern Italy, Turkey, the Middle East, and China.

39.9Q1 Development Finance

Sources of investment finance in developing countries; role of taxation and tax structure reform; development of financial institutions and capital markets; private and official finance from abroad and debt-service problems; problems of monetary management and export instability.

39.9R1 Seminar in Development Planning

Planning techniques at the national, regional project and plan level. Planning for system of regions; interindustry economic programming; interdependence, resource use, and structural change. Application of input-output and linear and non-linear optimal decision techniques to short-run planning and long-run projection. Evaluation of discontinuities, linkages, and "openness." Planning in closed and open economy. The role of the private sector and the governments, limits, sequence, and optimality in planning. Application of techniques to empirical examples. *Prep. Consent of instructor.*

39.9S1 Monetary Theory

A study of the relationships between money and economic activity with emphasis upon various quantity theory models and theories of the demand for money and velocity. *Prep. Macroeconomic Theory.*

39.9S3 Monetary Policy

A study of the interrelationships between aggregate economic activity, financial markets and central banking instruments, objectives and policy.

39.9T1 Public Policy and Finance

Techniques of fiscal policy, fiscal policy norms, public sector debt; tax policy; federal tax reform; the conflict between social implications of price stabilization and full employment; public expenditure policy and the interrelationship between monetary and fiscal controls. *Prep. Macroeconomic Theory.*

39.9T5 Capital Markets

Primary sources of savings and demand for financial assets; role of financial intermediaries; banking system and government lending agencies. Demand for funds and real investment — mortgage, corporate and government securities markets; interdependence of rate structures. Flow of funds data in relation to national income accounts.

39.9V1 Seminar in Money, Credit, and Banking

Selected topics in the economics of money, credit and banking. *Prep. Consent of instructor.*

39.9Z1 Master's Thesis Seminar (maximum 6 q.h.)

Thesis supervision by members of the department; approval of graduate adviser required.

39.9Z2 Readings in Economics (up to 3 q.h.)

Supervised reading in selected topics in economics. *Prep. Consent of instructor and approval of graduate adviser.*

39.9Z5 Doctoral Dissertation Seminar (no credit)

Prep. Approval of graduate adviser required.

english

Gordon E. Pruett, Ph.D., Princeton, Acting Chairperson

Professors

Stanley J. Trachtenberg, Ph.D., New York University, Director of Graduate Studies
Victor E. Howes, Ph.D., Yale University
Samuel French Morse, Ph.D., Boston University
Robert B. Parker, Ph.D., Boston University
Kinley E. Roby, Ph.D., Pennsylvania State University
Paul C. Wermuth, Ph.D., Pennsylvania State University

Associate Professors

Samuel J. Bernstein, Ph.D., Brandeis University
Robert J. Blanch, Ph.D., State University of New York, Buffalo
Frank C. Blessington, Ph.D., Brown University
Irene R. Fairley, Ph.D., Harvard University
George S. Fayen, Ph.D., Yale University
Gerald R. Griffin, Ph.D., University of Massachusetts
M. X. Lesser, Ph.D., Columbia University
James Nagel, Ph.D., Pennsylvania State University
Jane A. Nelson, Ph.D., University of Michigan
Herbert L. Sussman, Ph.D., Harvard University
Joseph E. Westlund, Ph.D., University of California, Berkeley

Assistant Professors

Wallace E. Coyle, Ph.D., University of Massachusetts
Timothy R. Donovan, Ph.D., University of Wisconsin
Stuart S. Peterfreund, Ph.D., University of Washington

THE MASTER'S DEGREE

The Department of English offers a program leading to the M.A. degree. The courses emphasize training in research and criticism in the fields of English and American literature, and they provide the opportunity for the student to acquire the comprehensive background necessary for a career as a scholar, teacher, and writer.

Admission

Applicants are judged favorably if they do superior work in their undergraduate preparation and do significantly better than average in the verbal and advanced sections of the Graduate Record Examination, the scores of which are required before an application will be considered. An applicant is expected to have had at least 24 semester credits in English courses on a 4 point scale. Recommendations should be submitted by former English

professors. An applicant who is deficient in any one of these areas may be admitted as a provisional student.

The category of special student is provided for those nondegree students who wish to take a summer course or those already enrolled in a graduate program in another institution who wish to transfer credit. A holder of a graduate degree in English may also enroll as a special student.

Program

A total of 14 courses or 42 quarter hours are required of which 3 quarter hours must be taken from each of the following groups:

- I. Bibliography
- II. Medieval literature or linguistics
- III. Sixteenth- and seventeenth-century English literature or seventeenth- and eighteenth-century American literature
- IV. Eighteenth- and nineteenth-century English literature or nineteenth-century American literature
- V. Twentieth-century English literature or twentieth-century American literature

Each student must also satisfy the requirements by taking at least one course in English before 1800 and at least one in American literature.

A total of 15 quarter hours of seminar courses are required.

A student must elect at least one area in American and one in British literature on the comprehensive examination.

Concentrations in British and American literature are also offered.

Concentration in British Literature

A total of 14 courses or 42 quarter hours are required of which 7 courses/21 quarter hours in British literature must be distributed as follows:

- I. Bibliography
- II. Medieval literature or linguistics (1 course/3 quarter hours)
- III. Sixteenth- and seventeenth-century English literature (2 courses/6 quarter hours)
- IV. Eighteenth- and nineteenth-century English literature (3 courses/9 quarter hours)
- V. Twentieth-century British literature (1 course/3 quarter hours)

Two courses/6 quarter hours are required in American literature.

A total of 15 quarter hours of seminars are required.

The student must elect 3 areas in British literature on the comprehensive examination, one of which must be the individual work.

Concentration in American Literature

A total of 14 courses or 42 quarter hours are required of which 7

courses/21 quarter hours must be in American literature, with 3 of the 7 distributed as follows within the concentration:

- I. Bibliography
- II. Medieval literature or linguistics (1 course/3 quarter hours)
- III. American literature to 1800 (1 course/3 quarter hours)
- IV. Nineteenth-century American literature (1 course/3 quarter hours)
- V. Twentieth-century American literature (1 course/3 quarter hours)

Two courses/6 quarter hours must be taken in English literature. One of them must be in literature before 1800.

A total of 15 quarter hours of seminars are required.

The student must elect 3 areas in American literature on the comprehensive examination, one of which must be the individual work.

Course Numbers

The number system follows the following logic:

Methods courses	30.8A0-8A9; 30.9A0-9A9
Genre	30.8B0-8B9; 30.9B0-9B9
Linguistics	30.8C0-8C9; 30.9C0-9C9
English literature	30.8D0-8K9; 30.9D0-9K9
Medieval	30.8D0-8D9; 30.9D0-9D9
Renaissance	30.8E0-8E9; 30.9E0-9E9
Seventeenth-century	30.8F0-8F9; 30.9F0-9F9
Restoration and eighteenth-century	30.8G0-8G9; 30.9G0-9G9
Romantic	30.8H0-8H9; 30.9H0-9H9
Victorian	30.8J0-8J9; 30.9J0-9J9
Modern British	30.8K0-8K9; 30.9K0-9K9
American literature	30.8L0-8N9; 30.9L0-9N9
Seventeenth- and eighteenth-century	30.8L0-8L9; 30.9L0-9L9
Nineteenth-century	30.8M0-8M9; 30.9M0-9M9
Twentieth-century	30.8N0-8N9; 30.9N0-9N9
Special topics	30.8P0-8Q9; 30.9P0-9Q9
Writing courses	30.8R0-8R9; 30.9R0-9R9
Thesis/Independent Study	30.9Z1/30.9Z2

Transfer Credit

A student may transfer from another institution no more than 12 quarter hours (9 semester hours) of graduate credit in English. Within this limit, graduate courses in other fields may also be transferred if their relevance to the student's specialized interest can be demonstrated. In every case, a

petition for graduate credit must be sent to the Director of the Graduate School of Arts and Sciences with a copy of an official transcript.

Thesis

A thesis is optional. A student wishing to write a master's paper must secure the approval of a graduate faculty member and write the thesis under the supervision of an adviser. Six credits in lieu of course work are allowed. The student must enroll in 30.9Z1, Thesis, to obtain credit. Papers must conform to the guidelines laid down in the *MLA Style Sheet*.

Directed Study

A student may apply for a maximum of six hours of directed study, not including a thesis.

Students should obtain the consent of their academic adviser and then that of the instructor who will direct the study. A course proposal should be developed, outlining the works to be covered, the general requirements to be met, and the credits for which the study is offered. Such a proposal should be submitted to the graduate director for approval and becomes part of the student's file.

Directed study is not advised when a course in the same concentration is to be offered during the academic year, unless that course serves as the basis for more detailed study in the same area. Where possible, directed study should be organized around a specific problem or figure and should not, as a rule, substitute for regular course offerings.

Comprehensive Examination

A four-hour comprehensive examination is required. It will be given during the fall and spring quarters. Copies of previous examinations are available in the graduate director's office. A student must accrue 30 quarter hours of credit before being eligible to take the examination. The examination may be taken only twice. As an option, students may choose an oral examination in lieu of the written comprehensive. This must be arranged with the graduate director.

Language Requirement

Normally a degree candidate must pass a reading examination in French or German or Latin. Substitutions must have the approval of the graduate director. Exemption from the examination may be obtained by submitting evidence of having passed with at least a grade of C an *advanced* undergraduate language course carrying six semester credits or eight quarter credits. The examinations will be offered during the fall and spring quarters.

Grades

Grades given are A, B, C, or F, on a four-point scale. To qualify for the degree a student must achieve a minimum Q.P.A. of 3.0. Students who receive more than two C's in their first two quarters of residence may be dropped from the program. An incomplete grade is granted only in extraordinary circumstances and not given automatically; the student *must arrange* with the instructor a timetable within which the unfinished work may be completed. Professors retain the right to award an F grade should the student fail to finish work in the stipulated time. I grades automatically become permanent after a year's passage.

Residence and Time Limitation

A student who does not register for a course in a calendar year must reapply for admittance to the program. Course credits are valid for a maximum of seven years unless an extension is allowed by the Director of the Graduate School of Arts and Sciences.

Awards

A limited number of teaching Assistantships (TAs) are awarded on a competitive basis. All applicants and students are potential candidates. If you think you have special qualifications, not apparent in your application, you are invited to submit evidence to the graduate director. At present, the stipend is \$3000 in the first year and a like amount in the second. Normally a Teaching Assistant takes two courses each quarter, but may take more with permission. Teaching Assistants are expected to maintain a superior average in course work and make satisfactory progress toward the degree.

Northeastern University Fellowships (NUFs) are tuition waiver awards.

Extension Courses

No more than 21 credits in Northeastern courses given at the Burlington campus will be credited toward the degree.

PROGRAM OF ADVANCED LITERARY STUDY

The Department of English offers a program of advanced work in humanistic literary study leading to a Certificate of Advanced Graduate Study. It is designed for those people who already hold the master's degree. Neither an intermediate step toward a research-oriented Ph.D. nor instruction in pedagogy, the program is designed as "state-of-the-art" training in literary studies. The program is directed toward practitioners in the field as well as those for whom continuing literary study is an end in itself. The program is designed for both full-time and part-time study. Financial aid is available.

Admission

Applicants must have a master's degree and are expected to submit transcripts of undergraduate and graduate work.

Program

Each student will follow an individualized coherent course of study built around his or her own needs and designed in close association with a faculty adviser. The student will develop the outline of this program by the end of the first quarter of work at Northeastern and follow the program, under the supervision of the adviser, throughout his or her work at Northeastern. Forty-two quarter hours of work are needed to complete the program. With permission of the adviser, the student may take up to three graduate courses in any other department.

Examination

The student must pass an individual comprehensive examination based upon his or her own program of study. The examination will include the evaluation of a lecture/classroom presentation.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified. All seminars are noted by a 900 level designation.

GROUP I

(three quarter hours required)

30.8A1 Bibliography and Literary Historiography

Materials and techniques of research in English and American literature; bibliography, form, and content of papers and theses; problems of literary history.

GROUP II

(three quarter hours required)

30.8C1 Historical Linguistics I

Written records; the classification of language; phonetics and phonetic change; the comparative method; dialect geography.

30.8C2 Historical Linguistics II

Continuation of 30.8C1. Fluctuation; analogic and semantic change; cultural, intimate, and dialect borrowing. *Prep. 30.8C1.*

30.8C4 Semantics

The relation between language and behavior; the concept of change, variety, and uniqueness; symbols; levels of abstraction; habits of evaluation of linguistic phenomena; and modification of such habits in the direction of human adjustment, understanding, and survival.

30.8C5 History of the English Language I

The nature and origin of language; ancestry and early growth of English; phonetics, sound-change, and history of English sounds; history of English inflections; sources of the vocabulary; the making of words.

30.8C6 History of the English Language II

Semantic change; syntax and usage; dictionaries, spelling, pronunciation, variations, and usage. *Prep. 30.8C5.*

30.8C7 Language and Its Structure

Introduction to the study of language, the principles and methods of linguistic description; the development of the science of language, of descriptive and generative linguistics. Emphasis on goals of modern linguistic theory.

30.8D1 Introduction to Old English

An introduction to Anglo Saxon as language; vocabulary, grammar, morphology.

30.8D6 Chaucer's Troilus and Criseyde and Other Poems

The Book of the Duchess, The House of Fame, and Troilus and Criseyde, with a look at *The Romaunt of the Rose*.

30.8D7 Chaucer's Canterbury Tales

Selected *Canterbury Tales*, including the *Knight's Tale*, *Miller's Tale*, *Wife of Bath's Prologue and Tale*.

30.9C1 Phonetics and Dialectology

Mastering of the International Phonetic Alphabet (IPA) and of a standard phonemic alphabet; their application to practical work in recording and studying both standard speech and dialects.

30.9C2 Descriptive Linguistics

Intonation (stress, pitch, juncture); phonemics; morphemes and morphology; syntactic devices; the process of communication; variation in speech. *Prep. 30.9C1.*

30.9C5 Transformational and Generative Grammar of English

Deep and surface structures and transformations necessary to generate the latter; graphic representations of structure; deep-structure nature of adjectives, pronouns, prepositions, auxiliaries, possessives, comparison with traditional grammar.

30.9C7 Linguistics and Literary Study

Language viewed in its special function as literary medium. Linguistic approach to style, metaphor, form and meaning. Representative works of major writers, poetry and prose, studied for characteristic formal properties. Discussion of contribution of linguistic analysis to literary criticism, and to a theory of literature.

30.9D1 Beowulf

An intensive study of the structure, theme, symbolism, and imagery in *Beowulf*.

30.9D2 Old English Poetry

Major Old English poetic works (exclusive of *Beowulf*), including *Dream of the Rood*, *Battle of Maldon*, *The Wanderer*, and *The Seafarer*.

30.9D5 Middle English Lyrics and Drama

A study of the epic and romance, concentrating on the transformation of the epic to the courtly hero: works to include in translation *Beowulf*, *Chretien de Troyes*, the *Nibelungenlied*, and *Le Morte D'Arthur*.

30.9D8 Studies in Fourteenth-Century Literature

Major works in Middle English including *Sir Gawain and The Green Knight*, *The Pearl*, and *Piers Plowman*.

GROUP III

(three quarter hours required)

30.8E1 Tudor Literature

Wyatt and Surrey, Sidney, Raleigh, and the beginnings of prose fiction.

30.8E4 Renaissance Drama

Twelve representative Elizabethan and Jacobean comedies and tragedies.

30.8F1 Seventeenth-Century Literature

Major prose and poetry of the seventeenth-century, excluding drama: Bacon, Hobbes, Browne, Bunyan, Donne, Herbert, Jonson, Marvell, and others.

30.9E1 Studies in Renaissance Poetry

Shakespeare, Marlowe, Jonson *et al*.

30.9E4 Jacobean Drama

About ten plays, mostly tragedies (except for Jonson); the course presumes a knowledge of Shakespeare's late tragedies and romances.

30.9E5 Shakespeare's Histories

The English history plays from *Richard III* to *Henry V*, plus *Titus Andronicus*, *Julius Caesar*, and *Troilus and Cressida*.

30.9E6 Shakespeare's Tragedies

Eight plays from *Richard II* to *Antony and Cleopatra*.

30.9E7 Shakespeare's Comedies

Eight plays from *Comedy of Errors* to *The Tempest*.

30.9E8 Problems of Shakespearean Interpretation

A study of various "problematic" plays; a general knowledge of Shakespearean drama and the sonnets is presumed.

30.9F1 Metaphysical Poetry

Analysis of the structure and texture of poems by Donne, Herbert, and Marvell to determine the distinguishing characteristics of the metaphysical approach to poetry.

30.9F4 Seventeenth-Century Thought

Discussion of seventeenth-century theories on science, religion, politics, and art as expressed in Bacon, Burton, Browne, Locke, and Hobbes.

30.9F6 Milton's Major Poetry

Milton's poetic and intellectual achievement will be studied by analyzing his major works. Particular emphasis will be given to *Paradise Lost* as an expression of Renaissance humanism and the culmination of the epic tradition.

30.9L1 Puritanism

A study of the rise and fall of American Puritan ideas of God, man, and society, and their effect on the national experience and imagination, with special emphasis on the work of William Bradford, Edward Taylor, and Jonathan Edwards.

GROUP IV

(three quarter hours required)

30.8G1 Restoration and Early Eighteenth-Century Literature

A critical study of neoclassical drama, poetry, and criticism: Restoration drama, Dryden, Pope, Addison, Steele and Gay.

30.8G6 Age of Johnson

Johnson, Boswell, and the Club: Burke, Goldsmith, and Gibbon; poetry of Cowper, Gray, Burns, and Smart.

30.8H1 Romanticism

General introduction to English Romanticism as an intellectual and artistic movement.

30.8J1 Victorian Literature

General survey touching upon major genres of Victorian literature with emphasis on the transition from the Victorian to the "modern." Such writers as Carlyle, Ruskin, the Brontës, Swinburne, Pater, Wilde.

30.8L1 American Literature to 1830

A survey of American literature during its first two centuries, from the Puritans to the Knickerbockers, from William Bradford to James Fenimore Cooper.

30.8M1 Nineteenth-Century American Literature

A critical examination of selected works of prose and poetry by major writers of the period: Poe, Hawthorne, Melville, Thoreau, Dickinson, and Longfellow.

30.9G2 Restoration and Eighteenth-Century Drama

Plays of Etherege, Wycherley, Dryden, Vanburgh, Congreve, Gay, Lillo, Goldsmith, and Sheridan.

30.9G3 Augustan Literature

Seminar investigating the origins of neoclassicism: classical theories of drama and literature from the works of Plato, Aristotle, Horace and Renaissance theorists. Expressions of augustan aesthetic: Dryden's *Essay of Dramatic Poesy*, Pope's *Essay on Criticism*, Addison's essays, Johnson's *Preface to Shakespeare*, selected writings by Rhymer, Dennis, Burke, and others.

30.9G5 Eighteenth-Century Thought

Images of London: ambivalence and satire in urban literature; a survey of novels, essays, plays, and poetry treating life in an urban milieu.

30.9G7 Eighteenth-Century Fiction

Novels by Defoe, Fielding, Richardson, Smollett, Sterne and Austen.

30.9G8 Individual Eighteenth-Century Novelist

Henry Fielding.

30.9H1 Romantic Poetry I

A study of the first generation of British poets (Blake, Wordsworth, Coleridge) whose concern for individual dignity and imaginative freedom came to be characterized as Romanticism.

30.9H2 Romantic Poetry II

Second generation of British Romantics: Byron, Keats, Shelley.

30.9H3 Problems of Romanticism

Romantic attitudes towards mankind in relation to self, society, and the universe, and romantic attitudes towards the individual person as Poet, with the impact these attitudes have upon the form and thematic substance of authentic and fictional autobiography in poetry and prose.

30.9H8 Individual Romantic Writer

An intensive reading of one major British writer whose themes, style, and philosophy are representative of the Romantic Era (1794-1832).

30.9J1 Early Victorian Poetry

Close study of Tennyson, Browning, Arnold.

30.9J2 Late Victorian Poetry

The Pre-Raphaelite circle, and the movement toward modernism: D. G. Rossetti, Swinburne, G. M. Hopkins.

30.9J5 Prose of the Victorian Age

Emphasis on late Victorian period and particularly on the development of prose forms such as utopian literature, fantasy, science-fiction, detective fiction and the imperial adventure story: Morris, Pater, Kipling, Wilde, Wells, Carroll.

30.9J7 Victorian Novel

Close study of major works by Dickens, Eliot, the Bröntes, Hardy.

30.9J8 Individual Victorian Novelist

Recent critical approaches to the novels of Charles Dickens.

30.9L2 Literature of the New Republic

The beginning of the American literary tradition in poetry, fiction, and drama, from Freneau to Cooper, 1765-1830.

30.9M1 Transcendentalism

From religious or metaphysical idealism to theories of self-transformation, with emphasis on Emerson and Thoreau and consideration of related figures such as Kant, Coleridge, Carlyle, William James, Mumford, Jung.

30.9M2 Nineteenth-Century American Poetry

The legacies of Whitman and Dickinson.

30.9M7 The Romance in America

An attempt to define American Romance through the study of Cooper's Leatherstocking novels, the major novels of Hawthorne, and Melville's *Moby Dick* and *Billy Budd*.

30.9M8 The Rise of Realism

An examination of Local Colorism, Realism, and Naturalism in the works of Twain, Howells, James, Dreiser, Norris, and readings in European Realism.

30.9P2 Comedy of Disaster in Nineteenth- and Twentieth-Century Novels

A study of the dark aspects of comedy including the element of the grotesque. Beginning with Poe, Melville, and Twain, the course concludes with an examination of black comedy of the 'sixties.

30.9P4 The American 1890's

Intensive study of the works of Stephen Crane with some attention to other writers of the period, including Howells, Frederic, Garland, and to the cultural milieu.

30.9P5 Literature of the American South

A study of the southern literary experience from early nineteenth-century to mid-twentieth, from Simms to Faulkner.

30.9P8 Art and Literature in the Victorian Period

Relationships of visual art, literature, and aesthetic theory in the Victorian period. Emphasis on Ruskin, Pre-Raphaelite circle, Pater, Whistler, Wilde.

30.9P9 Twain and James

Study of some of the major works of two important authors who were contemporaries, but opposites in approach, material, and point of view.

GROUP V

(three quarter hours required)

30.8K1 Twentieth-Century British Literature

Theme and structure in the work of several dramatists from Shaw to Osborne and of several novelists from Conrad to Anthony Powell with an emphasis on major trends in the novel and in drama during the present century.

30.8N1 Twentieth-Century American Literature

Chance collisions: Adams, Dreiser, Crane, Dos Passos, Fitzgerald, Cozzens, Faulkner. The beginnings and development of Naturalistic fiction.

30.9K1 Early Twentieth-Century British Poetry

Twentieth-century poets whose work has shaped and established the modern tradition, or extended our understanding of the traditions of the past: Hardy, Yeats, Lawrence, Muir, Auden, Owen, Thomas.

30.9K2 Contemporary British Poetry

A seminar concentrating on the main currents in British poetry since 1945, including

an examination of the later work of the poets of Auden's generation as well as such writers as Philip Larkin, Edwin Muir, William Plomer, A. D. Hope, Basil Bunting, and others, especially those younger writers whose work represents a break with established traditions.

30.9K3 Individual Modern British Poet

W. H. Auden. A study of Auden's achievement as poet, critic, dramatist, and translator, in the context of his age.

30.9K4 Twentieth-Century Irish Renaissance

A study of the emergence of a distinctive Irish literary tradition through concentration on the work of the main figures of the Irish Literary Revival, with particular emphasis on Yeats, Joyce, Synge, and O'Casey; minor concentration will be on post-Revolutionary and contemporary Irish writers. O'Faolain, O'Connor, and Behan.

30.9K7 Twentieth-Century British Fiction

Major figures of the modern and the contemporary periods: Conrad, Joyce, Cary, Beckett, Braine, Fowles, Snow, Lawrence, Woolf, Murdoch, Lessing, Huxley.

30.9K8 Individual Modern British Novelist

James Joyce, Samuel Beckett, D. H. Lawrence.

30.9N1 Twentieth-Century American Poetry

Twentieth-century poets who have struggled to establish a tradition for American poetry and whose examples have dominated poetry up to the present: Robinson, Frost, Stevens, W. C. Williams, M. Moore, Eliot, Pound, Crane, Cummings, and the Fugitives.

30.9N2 Individual Modern American Poet

A seminar concentrating on the achievement of a major American poet (e.g., Robert Frost, Wallace Stevens, William Carlos Williams), including an assessment of influence upon contemporaries and the writers of succeeding generations. The course places the poet in cultural context, and attempts to define his or her accomplishment as exactly as possible.

30.9N2 Individual Modern American Poet

Wallace Stevens.

30.9N3 Contemporary American Poetry

Lowell, Bishop, Bronk, Roethke *et al.*

30.9N7 Modern American Novel

Comic Resistance: West, Ellison, Mailer, Hawkes, Barth. The exhaustion of possibilities and the post-modern idea of self.

30.9N8 Individual American Novelist

An in-depth examination of the work of a major figure in American fiction, focusing on the cultural context out of which he or she emerges. Recent selections for this course have been Hemingway, Fitzgerald, Mailer, Faulkner, and Bellow.

30.9N9 Modern American Drama

Philosophic and aesthetic trends among such playwrights as O'Neill, Williams, Miller, Albee, Simon, and others.

ELECTIVES**30.8B1 Theories of Criticism**

An introduction to the study of modern and contemporary literary theory and criticism: "New Critical," Marxist, psychoanalytic, structuralist, and more recent developments.

30.9B1 Critical Schools

A seminar concentrating on one major modern or recent development in literary theory and criticism such as structuralism or archetypal criticism. The subject of the seminar changes from year to year.

30.9B3 English Prose Style

The development of prose style in English (chiefly expository), from the sixteenth century to the present. Most major authors are represented, from Roger Ascham to James Baldwin.

30.9B4 Short Fiction

The short stories of Sherwood Anderson and Ernest Hemingway and their contribution to American literature.

30.9B5 Comic Drama

The Comic Spirit and its manifestations in dramatic literature and performance. The nature and forms of comic playwriting from Aristophanes to the present. An examination of the theater's comic forms: farce, comedy, satire, parody.

30.9B6 Tragic Drama

This course will consider important theories of tragedy and certain plays in an effort to consider the relation, if any, which exists between theory and practice of the tragic genre.

30.9B7 Theatrical Styles

An examination of modern dramatic expression and theory. The course will give particular attention to absurdist drama, existentialist drama, and Brecht's theatre of alienation.

30.9B8 Humor in American Literature

An account of American humorous writing from 1830 to the present. Various types of literary humorists are studied, such as Artemus Ward, Mark Twain, George Harris, and others. Some attention also to modern humorists such as Thurber.

30.9B9 Satire

A theoretical study of satiric forms, Roman, Renaissance and neoclassical verse satire, and later satiric narratives. Writers surveyed may include Horace, Juvenal, Pope, Swift, Voltaire, Byron, Evelyn Waugh.

30.9R1 Creative Writing I

Prose fiction.

30.9R2 Creative Writing II

Prose fiction.

30.8R4 Theory and Teaching of Writing

Designed for teachers or prospective teachers of writing in college or the public schools, this course examines several premises of writing instruction and how they can provide successful classroom practices.

30.9R3 Writing for the Professions

This course will examine the various forms of business communications and offer practical experience in writing business letters, memorandums, case studies, proposals, and reports for students in the Graduate School of Business Administration. Open to the Graduate School of Business Administration *only* and limited to an enrollment of 15 students.

30.9S3 Form, Structure, and Meaning in Modern Literature

The aim of the course is to explore the inter-relatedness of form, structure, style, and meaning in modern American and British writing. Some of the writers to be studied are T. S. Eliot, Virginia Woolf, Joseph Conrad, e. e. cummings, William Faulkner, Ernest Hemingway, and Samuel Beckett.

30.9S5 Literature and the Visual Arts

Examination of the complex relationships between literature and visual art. Consideration of such topics as theoretical approaches to this relationship, the work of painter-poets, verbal descriptions of art (e.g., poems about paintings), visual representations of literature (e.g., book illustration, literary painting), works in which verbal and visual art are integrated. The course will be organized by issues rather than historically. Each student will work on an individual project. There will be field trips.

30.9S6 Problems in Writing

In this course, general writing problems will be considered along with those posed by particular professional and other responsibilities.

30.9S7 Nineteenth-Century European Novel

Examination of major novelists and major literary movements in nineteenth-century Europe. Discussion of such novelists as Balzac, Stendahl, Huysmans, Flaubert, Dostoevski, Turgenev, and Hardy.

30.9S8 Literature and Psychology

An examination of theoretical positions and practical problems in the relationships between literature and psychology. Psychological interpretations of lyrics, works of fiction, and dramas will be examined. In addition to the selected essays on certain literary works, several theoretical texts will be studied.

30.9S9 Literary Impressionism

Intensive study of the theory of Impressionism (with some attention to music and painting as well as literature) and its role in literary history. Readings will explore French, British, Scandinavian, and American writers, especially Stephen Crane, Ford, Conrad, James, Moore, Hemingway and Faulkner.

30.9Z1 Thesis

Six quarter hours maximum; by arrangement.

30.9Z2 Independent Study

By arrangement.



history

Professors

Raymond H. Robinson, Ph.D., Harvard University, Chairperson
Philip N. Backstrom, Jr., Ph.D., Boston University
Martha E. François, Ph.D., Harvard University

Associate Professors

Charmarie J. Blaisdell, Ph.D., Tufts University
Ballard C. Campbell, Ph.D., University of Wisconsin
William M. Fowler, Ph.D., University of Notre Dame
Norbert L. Fullington, Ph.D., Harvard University
Donald M. Jacobs, Ph.D., Boston University
John D. Post, Ph.D., Boston University
Stanley R. Stembridge, Ph.D., Harvard University

Assistant Professors

Gerald H. Herman, M.A., Northeastern University
LaVerne J. Kuhnke, Ph.D., University of Chicago
Clay McShane, Ph.D., University of Wisconsin
Martin R. Ring, Ph.D., Tulane University

THE MASTER'S DEGREE

Admission

Procedures and requirements are discussed on page 14. Applicants for the fall quarter who submit their application and all supporting documents by March 15 will be notified on or about April 1. Students who are interested in financial assistance must file all material by March 15.

Program

Forty-one quarter hours of academic work are required. Full-time students take three or four courses each quarter.

All students must take the following courses:

23.800 Methodology
either 23.801 European Historiography or 23.900 American Historians
Two courses specifically labeled "seminar," except that students writing theses need take only one seminar.

Students must complete 23.800 prior to enrolling in seminars, and grades of at least B must be obtained in the seminars.

Students must complete at least one course in each of three areas:

Group I, Europe; Group II, United States; and Group III, Other Areas.

Group requirements will not be satisfied by the historiography courses, 23.801 and 23.900.

With the approval of the faculty adviser, a maximum of nine quarter hours may be elected from graduate courses in other departments and a maximum of 12 quarter hours may be elected from advanced undergraduate courses in history or related subjects.

A thesis is optional with the approval of the graduate committee. If approved, a thesis carries nine quarter hours of credit.

Comprehensive Examination

All degree candidates must pass a comprehensive examination, written or oral.

Language Requirement

Proficiency must be demonstrated in a foreign language approved by the department, or, as an alternative option, demonstrated proficiency in either computer programming or advanced statistics.

Financial Aid

In addition to teaching and tuition assistantships, there is a scholarship in memory of Professor Robert A. Feer, a member of the Department of History from 1963 to 1970.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit except seminars which carry four quarter hours and other courses where noted.

23.800 Methodology

The objectives, methods, and resources of the historian.

23.801 European Historiography

The development of historical writing from ancient times to the present.

23.802 Ancient Greece (Group I)

Selected topics in the history of ancient Greece.

23.803 Ancient Rome (Group I)

Selected topics in the history of Rome in the period of the Republic or the Empire.

23.806 Intellectual History of Europe, 1688 - 1789 (Group I)

The broad spectrum of eighteenth-century thought, with emphasis on scientific, religious, and political ideas.

23.807 Intellectual History of Europe, 1789-1870 (Group I)

The great age of liberal and nationalistic thought. Social problems created by industrialism and various proposals to solve these problems will be examined.

23.808 Intellectual History of Europe, 1870-1950 (Group I)

The intellectual developments which have brought Europe to its present position in world affairs. Topics considered include theories of evolution, scientism, radical socialism, and fascism.

23.809 Seminar in European Intellectual History (Group I)

Research and writing on special topics in European intellectual history.

23.810 Social History of Europe, 400-1350 (Group I)

A study of society in the "Age of Faith," with special emphasis on aspirations, way of life, and cultural achievement.

23.811 Social History of Europe, 1350-1650 (Group I)

A study of social structure, standards of living, aspirations and frustrations, and cultural achievement in an age of Black Death, Renaissance, and religious controversy.

23.812 Social History of Europe, 1650 - 1850 (Group I)

Exploration of social development and cultural achievement in an age of revolutions — intellectual, political, agricultural, and industrial.

23.813 Economic History of the Modern Western World (Group III)

Topical analysis of the economic development of the modern western world.

23.818 Seminar in the Renaissance (Group I)

Research and writing concerning the Renaissance.

23.819 Seminar in the Reformation (Group I)

Research and writing concerning the Reformation.

23.820 The Renaissance (Group I)

European political and cultural life from the thirteenth to the seventeenth centuries, with attention to Humanism and to the rebirth of classicism in literature and the arts.

23.821 The Reformation (Group I)

The development of the Christian Church from the thirteenth to the seventeenth centuries, with attention to the conflict between church and state, the impact of the Renaissance, the rise of the Protestant sects, and the wars of religion.

23.822 European Urban History to 1750 (Group I)

A study of urban places from Roman times to 1750 with special consideration of origins; layouts; political, economic, and social life; and the effects of towns on society.

23.823 European Urban History since 1750 (Group I)

A study of urban places since 1750 with attention to the growth of population, industrialization, and bureaucratization and attendant problems.

23.827 Seminar in England, 1558-1660 (Group I)

A study of political, religious, social, and economic problems from Elizabeth I to the Restoration.

23.830 Britain, 1688-1815 (Group I)

Topics include constitutional evolution, political parties, social and economic change, religious and intellectual developments, cultural achievements, and Scotland and Ireland.

23.831 Britain, 1815-1914 (Group I)

Aspects of nineteenth-century Britain, including reform of parliament, liberalism and socialism, the Irish question, imperialism, and Victorian ideals and attitudes.

23.832 Seminar in Twentieth-Century Britain (Group I)

Selected topics for research and writing.

23.833 Seminar in Nineteenth-Century Britain (Group I)

Selected topics for research and writing with special emphasis on the social effects of industrialization.

23.835 France, 1180-1661 (Group I)

The history of France from the time of Philip II to the majority of Louis XIV with special emphasis on the problems of cultural, political, and economic unity and the effects of the Renaissance and the Reformation.

23.836 France, 1661-1830 (Group I)

A study of the "Old Regime," including an examination of the reign of Louis XIV, the decline of the French monarchy in the eighteenth century, and the general effects of the Enlightenment; an analysis of the revolutionary period, 1789 to 1830.

23.845 Seminar in Nineteenth-Century Europe (Group I)

Research and writing in European history from 1850 to 1900.

23.850 Seminar in Russian History (Group I)

A narrow period or special topic in Russian history. *The course presupposes a basic knowledge of Russian history and will require extensive work on a research paper.*

23.855 Socialism and Revolution (Group I)

Studies in the history of socialism and revolution from the early nineteenth-century utopias to the New Left of the 1960s.

23.856 New Perspectives on Revolutionary Socialism (Group I)

A review of the revolutionary Socialist movement which incorporates the innovating perspectives of New Left scholarship, stressing the anti-state or "libertarian" side of the movement as well as the traditional "authoritarian" Marxism.

23.860 Diplomatic History of Europe, 1815 - 1914 (Group I)

The foreign policies of the chief European powers, with emphasis on changing alliances and alignments, imperialistic rivalries, and efforts at international cooperation.

23.861 Seminar in Imperialism (Group I)

An inquiry into the motives underlying European expansion in the late nineteenth century.

23.862 Twentieth-Century Europe (Group I)

The political history of Europe since 1900, with attention to World War I, the rise of Communism and Fascism, the struggle for security in the western democracies, World War II, and the Cold War.

23.863 Seminar in Twentieth-Century Europe (Group I)

A study of a selected controversy in contemporary European History.

23.870 China to 1800 (Group III)

History of Chinese civilization from antiquity through Confucianism to the period of Western impact.

23.871 Modern China (Group III)

Revolution and institutional change in China from the nineteenth century to 1927.

23.872 Communism in China (Group III)

A study of the Chinese Communist movement from its origins in the 1920s to the present.

23.873 Japan to 1600 (Group III)

A survey of early Japanese history with special emphasis on the social, political, intellectual, and literary history of the medieval period.

23.874 Japan, 1600 - 1868 (Group III)

A study of the Tokugawa period, emphasizing the problems of late feudal control, urban and rural developments, social, intellectual, and literary history.

23.875 Modern Japan (Group III)

The history of Japan since the fall of the Tokugawa, emphasizing political and economic developments, especially after World War II.

23.883 History of the Islamic Peoples (Group III)

A study of the history, culture, and religion of the followers of Muhammad from 600 to 1800.

23.884 Modern Middle East (Group III)

A study of the Middle East in the twentieth century.

23.890 History of Exploration (Group III)

A comprehensive survey of exploration from ancient times to the present with emphasis on the motives for exploration and their impact on both the regions discovered and on those doing the discovering.

23.895 Approaches to World History (Group III)

An interdisciplinary examination of the study of civilization emphasizing various methodologies and theories and testing them by studying specific historical periods and cultures.

23.896 Psycho-History (Group III)

An introduction to the concepts, scholarship, problems, and directions of psycho-historical studies.

23.898 Population in History (Group III)

An application of demographic theory to history.

23.900 American Historians

The writing of American history by Americans from colonial times to the present with emphasis on changes in both form and substance.

23.905 Colonial America: The Seventeenth Century (Group II)

Exploration of the New World, settlement of the English North American mainland colonies, and the adaptation of European institutions and ideas to New World conditions.

23.906 Colonial America: The Eighteenth Century (Group II)

The expansion of the English colonies in the New World, the development of political and social institutions, and the sources of friction with England to 1763.

23.907 The American Revolution (Group II)

Topics in the history of the American Revolution from 1763 to 1783.

23.909 Seminar in Colonial and Revolutionary America (Group II)

Research and writing on some topic in American history prior to 1789.

23.910 American Social History, 1607-1815 (Group II)

The ethnic foundation of American society; the ways Americans made their living, and the ways in which they lived during the colonial and early national periods.

23.911 American Social History, 1815-1900 (Group II)

The King Cotton society of the South, the ferment of reform and industrialism in the North, the Civil War, and the materialistic civilization of the late nineteenth century.

23.912 American Social History, 1900-1950 (Group II)

The transformation of the naive and idealistic America of the early twentieth century to life in a world in which technology has far outstripped man's mental and moral capacity to cope with it.

23.919 Boston As a City (Group II)

An in-depth examination of historic Boston from 1822 to the present. Especially emphasized will be Boston's early growth as a city, the Hub as a center of pre-Civil War reform, the coming of the Irish, Boston as America's Athens, the revolutionary shift from Yankee to Irish political domination, the flamboyant era of James Michael Curley, and the development of the "New Boston."

23.920 Seminar in American Urban History (Group II)

The political, economic, and social history of America's major cities, with special emphasis on Boston's last century.

23.921 American Social Structure (Group II)

Survey of population, residential, family, ethnic, and class patterns in American history.

23.922 American Immigration and Ethnicity (Group II)

Analysis of immigration to the United States, ethnicity and assimilation, and ethnic group diversity since 1800.

23.924 Topics in American Reform (Group II)

Selected studies of movements to change aspects of American Society.

23.926 Seminar in American Maritime History (Group II)

This seminar will deal with selected aspects of American maritime history. Possible topics range from early exploration to the age of nuclear propulsion and may include merchant and naval aspects of the subject.

23.929 The Age of Roosevelt (Group II)

An analysis of the foreign and domestic policies and programs of the four Roosevelt Administrations set within the context of world-wide depression and global war. Emphasis will be placed on the range of recent interpretations and analytic methods used in evaluating the place of Roosevelt in American history.

23.935 Seminar in Recent American History (Group II)

Special topics from the period 1896 to 1960 will be studied in detail, and students will present a research paper on a major person, action, or movement.

23.936 New Perspectives on City and Suburb (Group II)

Analysis of the emergence of the modern concept of suburban living in the nineteenth century and the evolution in the twentieth century of socially-segregated, politically-fragmented metropolitan areas in the United States.

23.937 American Politics, 1800-1877 (Group II)

The development of politics and parties in the nineteenth century.

23.938 American Politics, 1877-1920 (Group II)

Analysis of political patterns in the "transition" period.

23.939 Seminar in American Political History (Group II)

Research and writing on problems in American political history.

23.940 American Politics since 1920 (Group II)

Analysis of recent politics, emphasizing the Presidency, voting behavior, and party activity.

23.945 Topics in the Civil War and Reconstruction (Group II)

Analysis of key issues surrounding the events leading up to the Civil War, the war itself, and the Reconstruction period.

23.954 Media and History (Group III)

23.955 Historical Administration (Group III)

23.958 Historical Societies and Archives (Group III)

23.959 Oral History (Group III)

23.960 Historical Exhibits and Museums (Group III)

Approaches, techniques, and special problems in the presentation of history to the public through exhibits, films, and other audio-visual and written media. Guest lecturers from the field will present lectures, and students will have practical experience.

23.961 Historic Preservation (Group III)**23.964 Historical Editing** (Group III)

This course will serve as a laboratory for the study and practice of historical editing. Students will be introduced to the major collections of edited papers and will be taught to edit historical documents. Each student will be given an historical document to prepare for publication. Instruction will be given in the editing of history books and journals.

23.966 New Perspectives on American Slavery (Group II)

An in-depth examination of slavery in the Americas. Special emphasis will be placed on the impact of the slave trade; the development of slavery as an institution; the impact of slavery on the black family; the key role played by the black church; black resistance to slavery; the historiography of slavery, especially the two decades of reaction to the still controversial thesis of Stanley Elkins; and slavery from a comparative perspective, contrasting slavery in Latin America and the United States.

23.967 African-American History I (Group II)

The history of African-Americans to 1900, with emphasis on the role of black people in slavery and freedom.

23.968 African-American History II (Group II)

The history of African-Americans since 1900.

23.969 Seminar in African-American History (Group II)

Research and writing on an aspect of African-American history.

23.976 Canada and the United States (Group III)**23.990 Assigned Reading in History** (1 q.h.)

Assigned reading under supervision of a faculty member.

23.991 Thesis (9 q.h.)

Thesis supervision by members of the department.

23.994 Field Work in History I (4 q.h.)**23.995 Field Work in History II** (4 q.h.)

mathematics

Professors

Bohumil Cenkí, D.Sc., Charles University, Prague, Czechoslovakia
David I. Epstein, Ph.D., New York University
Holland C. Filgo, Jr., Ph.D., Rice University
Arshag Hajian, Ph.D., Yale University
Robert D. Klein, M.S., Northeastern University
Gabriel Stolzenberg, Ph.D., Massachusetts Institute of Technology
Harold L. Stubbs, Ph.D., Boston University
Jack Warga, Ph.D., New York University

Associate Professors

Samuel J. Blank, Ph.D., Brandeis University
Mark Bridger, Ph.D., Brandeis University
John N. Frampton, Ph.D., Yale University
Alberto R. Galmarino, Ph.D., Massachusetts Institute of Technology
Maurice E. Gilmore, Ph.D., University of California, Berkeley, Chairperson
Eugene H. Gover, Ph.D., Brandeis University
Nancy J. Kopell, Ph.D., University of California, Berkeley
Mark Ramras, Ph.D., Brandeis University
Richard A. Rasala, Ph.D., Harvard University
Thomas O. Sherman, Ph.D., Massachusetts Institute of Technology
Victor R. Staknis, Ph.D., Boston University
Betty Stark, Ph.D., University of Michigan

Assistant Professors

Gail A. Carpenter, Ph.D., University of Wisconsin
Agnes Chan, Ph.D., Ohio State University
Daniel I. Cohen, Ph.D., Harvard University
Harriet J. Fell, Ph.D., Massachusetts Institute of Technology
Samuel Gutmann, Ph.D., Massachusetts Institute of Technology
Nishan Krikorian, Ph.D., Cornell University
Michael Perloff, Ph.D. Candidate, Stanford University
Richard D. Porter, Ph.D., Yale University
Vera Proulx, Ph.D., Columbia University
Jayant Shah, Ph.D., Massachusetts Institute of Technology
Brian Smith, Ph.D., Princeton University

Instructors

John Casey, B.S., Ph.D. Candidate, Brown University

Admission Requirements

Applicants for admission must satisfy the admission requirements listed on page 14. In addition, they should have a background which includes

courses in linear and modern algebra, mathematical analysis and elementary differential equations.

Students who have deficiencies in these areas may be accepted if their overall college work is judged satisfactory. However, they will be expected to learn the material during the first two quarters. Some of the courses may be taken at Northeastern University during the summer preceding enrollment. Students may also choose to enroll in the introductory courses or make individual arrangements with their advisers.

THE MASTER OF SCIENCE DEGREE

There are three options for students enrolled in the Master of Science Degree program.

A. Full-time Program

Forty-eight quarter-hours are required for the degree.

Course Requirements

Forty quarter-hours of graduate credit from courses are required. The required courses are:

10.9A1, 10.9A3, 10.9A6	Analysis I, II, III
10.9A2, 10.9A4	Algebra I, II
10.9A5, 10.9A7	Topology I, II
10.9F6	Computer I

Each course represents 4 quarter-hours of credit.

In addition each student must select two courses from any graduate mathematics courses or any courses in other departments carrying graduate credit. The selection of the elective courses must be approved by student's faculty advisor.

A full-time candidate for the master's degree will normally take the courses listed above in the first five quarters of graduate study, according to the following schedule:

First Year		
Fall Quarter	Winter Quarter	Spring Quarter
10.9A1 Analysis I	10.9A2 Algebra I	10.9A4 Algebra II
10.9F6 Computer I	10.9A5 Topology I	10.9A7 Topology II
Second Year		
Fall Quarter	Winter Quarter	Spring Quarter
10.9A3 Analysis II	10.9A6 Analysis III	Elective or Thesis
Elective or Thesis	Thesis	

Thesis Requirements

Each student is required to demonstrate a proficiency in an independent work. Students should, with the help of their advisors, choose a topic they

want to investigate. In studying it, students should read texts and journal articles. In addition, they should try to solve problems, compute examples, modify proofs, and see whether or not the known results can be extended. Students should report on their work by writing the thesis and eventually giving a lecture.

The completed project represents eight quarter-hours.

B. Full-time Program with Option of Employment in Industry

This program, with its emphasis on applied mathematics and development of mathematical skills for solving concrete problems arising from science and engineering, leads to the M.S. degree in Mathematics. Forty-eight quarter-hours are required for the degree.

Course Requirements

In order to receive an M.S. degree in Mathematics with specialization in Applied Mathematics, a student must complete 12 graduate courses, each representing 4 quarter-hours of credit. Students may choose their own program, subject to the requirements listed below and the approval of the Applied Mathematics Committee.

The 4 required courses are Algebra I, Analysis I, and Computer Science I and II. In addition each student must take 5 of the following seven courses: Analysis II and III, Applied Math I and II, Probability I, Statistics I, and Numerical Analysis I. (General descriptions of these courses are given below.) In addition, three advanced courses are required in one or more of the following specialties: computer science, probability and statistics, optimization and control, numerical analysis, or classical applied mathematics and differential equations.

A student who is a recipient of a Teaching Assistantship will be expected to take 2 courses during the fall and winter quarters until all requirements are completed. If the student also obtains an industrial position, he or she will spend the spring and summer quarters at work. Students who do not hold Teaching Assistantships, or who are either unwilling or unable to obtain "cooperative" positions, may enroll in a larger number of courses simultaneously, and/or study during the spring and summer quarters, thus completing their graduation requirements in one or two years. Industrial employment cannot be guaranteed, nor is it required for graduation. Students who do not work during the spring and summer quarters may apply for Teaching Assistantships for these periods.

A full-time candidate for the master's degree with the option of employment in industry will take the courses listed above typically according to the following sample schedule:

1st Year

Fall Quarter

10.9A1 Analysis I
10.9F6 Computer I

Winter Quarter

10.9A2 Algebra I
10.9F7 Computer II

2nd Year**Fall Quarter**

10.9A3 Analysis II
Specialty

Winter Quarter

10.9A6 Analysis III
Specialty

3rd Year**Fall Quarter**

10.9H1 Statistics I
Specialty

Winter Quarter

10.9D1 Applied Math I
Specialty

Thesis Requirements

There are no thesis requirements with this option.

C. Part-time Program

Students in this program may progress according to their abilities and the time available. If students are deficient in any of the mathematics courses required for admission to the degree program, they will be required to satisfy their deficiencies by taking courses given for this purpose. Such courses will carry graduate credit, but the credit will be in addition to the regular degree requirements. The requirements are the same as for the full-time program (either A or B).

Other Requirements

There are no comprehensive examinations and no language requirements for the M.S. degree.

THE DOCTOR OF PHILOSOPHY DEGREE**Admission**

Students who have completed the full-time master's degree program or who have obtained a master's degree at another institution are eligible for admission to the doctoral program. Students who wish to earn the doctor's degree should inform the chairperson of the graduate committee of their desire to be doctoral candidates. Those who have been accepted as doctoral candidates will remain in that category as long as their progress is deemed satisfactory.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Course Requirements

The course requirements, in addition to the minimum master's degree requirements of 48 quarter hours of credit, are established by the departmental graduate committee for each candidate. In most cases, 32 quarter hours of additional work will be required.

Independent Work

Before starting their dissertation, doctoral students may be required to do some kind of independent project, possibly, but not necessarily, in conjunction with departmental seminars or courses. The aim of the project is to start students on independent work and to give them a practical way to learn research techniques. The M.S. Thesis will be acceptable, for example.

Minor Specialty

Each doctoral candidate will select some specific mathematical subject of an advanced nature, which must be reasonably unrelated to the topic of the student's dissertation. By means of reading, lecture courses, and/or seminars, the student should render work in this area equivalent to a good part of one full year's course work (12 quarter-hours). Approval of the area and the plan of work should be obtained in advance from the department graduate committee.

Language Requirements

Ability to read and translate mathematical texts and journals in two foreign languages must be established by each candidate. The languages may be chosen from French, German, and Russian; any other choice requires special approval. The students should notify the chairperson of the departmental graduate committee when they are prepared to be examined on each language. The examinations are conducted by members of the faculty of the mathematics department.

Teaching Requirement

Some teaching experience is required. This requirement may be satisfied by at least one year of service as a teaching assistant or by suitable teaching duties.

Dissertation

After the successful completion of their independent work when required, students shall select a dissertation adviser under whose guidance they will write their doctoral dissertation. They may be assisted by the departmental graduate committee in that selection if they wish it. The dissertation itself must represent an original solution of a problem in the chosen area of mathematics which makes some contribution to mathematical knowledge.

Final Oral Examination

This examination on the dissertation will be held in accordance with the graduate school regulations.

DESCRIPTION OF COURSES

The following courses are offered for those who wish to enter the master's degree program in mathematics, but who fail to satisfy the admission requirements. These courses will be taken in addition to the required course work in mathematics.

10.8B1, 10.8B2, 10.8B3 Abstract Algebra I, II, III (2 q.h.)

Groups, subgroups, normal subgroups, rings, ideals, integral domains, and fields. *Prep. Differential and Integral Calculus.*

10.8B4 Advanced Calculus I (2 q.h.)

Functions of one independent variable; limits, continuity, differentiability. Properties of continuous functions on a closed bounded interval. Rolle's theorem and the mean-value theorem. *Prep. Differential and Integral Calculus.*

10.8B5 Advanced Calculus II (2 q.h.)

Functions of several independent variables. Distance and open sets; limits, continuity. Properties of continuous functions on a closed bounded set. Differentiability and differentials, mean-value theorem, implicit function theorems, Jacobians and transformations. *Prep. 10.8B4.*

10.8B6 Advanced Calculus III (2 q.h.)

Sequences, sequences of functions, uniform convergence, series. Integration, line and surface integrals. *Prep. 10.8B5.*

The following courses may be used toward the degree requirements in mathematics.

10.8H3 Biostatistics (2 q.h.)

Methods of statistical inference with applications to biology and the medical sciences.

10.8K2 A First Course in Mathematical Logic (2 q.h.)

Propositional calculus, quantificational logic, first order theories through the Skolem-Lowenheim Theorem.

10.8K3 An Introduction to Recursive Function Theory (2 q.h.)

Turing machines. Partially computable functions. Primitive recursive and general recursive functions and predicates. Unsolvability of decision problems. Recursively enumerable sets of integers. The unsolvability of Hilbert's Tenth Problem.

10.8K4 Godel's Incompleteness Theorems (2 q.h.)

Formal number theory. Arithmetization. Godel's First and Second Incompleteness Theorems for formal number theory. *Prep. A knowledge of the methods of mathematical logic.*

10.8K5 Set Theory (2 q.h.)

The informal study of sets, including detailed discussion of the axiom of choice, well-ordered sets, and transfinite arithmetic.

10.8K6 Formal Set Theory (2 q.h.)

Versions of axiomatic set theory. The consistency of the continuum hypothesis and the axiom of choice. As time permits, the independence of the continuum hypothesis and the axiom of choice. *Prep. the equivalent of 10.8K2 and 10.8K5.*

10.9A1 Analysis I (4 q.h.)

Basic topics in analysis and topology, including metric spaces and normed linear spaces; continuity; compactness; completeness; differentiability; function spaces; polynomial approximations. *Prep. Advanced Calculus.*

10.9A2 Algebra I (4 q.h.)

Emphasis on group theory and linear algebra. Rings and modules will be defined. Groups: subgroups, cyclic groups, cosets, Lagrange's Theorem, normal subgroups, homomorphisms and automorphisms, permutations (cycle decomposition, parity, conjugacy classes). First and second isomorphism theorems, class equation, Sylow subgroups, direct products, finitely generated abelian groups. Linear algebra: bases and dimension, correspondence between linear transformations and matrices, systems of linear equations, row reduction, rank, determinant inner products, Gram-Schmidt, dual spaces, eigenvalues and eigenvectors, characteristic polynomial, minimal polynomial, spectral theorem for symmetric, hermitian, and unitary matrices.

10.9A3 Analysis II (4 q.h.)

Complex function theory, including the method of residues; evaluation of series and integrals; differential forms.

10.9A4 Algebra II (4 q.h.)

Finite extensions of fields, automorphisms, structure of finite fields, normal and separable extensions, Galois group, Fundamental Theorem of Galois Theory, cyclotomic fields, solvability of equations by radicals.

10.9A5 Topology I (4 q.h.)

General topological spaces. Compactness and connectedness. Separation properties. Products. Complete metric spaces. Baire category theorem. Quotient spaces. Function spaces. Elementary homotopy. Some of the functorial viewpoint.

10.9A6 Analysis III (4 q.h.)

Lebesgue measure and integration, convergence theorems. Applications to probability theory and Fourier series.

10.9A7 Topology II (4 q.h.)

Simplicial complexes, manifolds. Classification of surfaces. Orientation, Euler characteristic. Vector fields. Mod 2 degree of a map. Linear group manifolds. Fundamental groups, covering spaces. Seifert-Van Kampen Theorem. Fundamental group of surfaces.

10.9B3 Constructive Algebra (4 q.h.)

A constructive development of some of the old familiar areas of algebra: principal ideal domains, Dedekind domains, factorial domains, Noetherian rings.

10.9B4 Set Theory (4 q.h.)

First part: Informal study of sets, including detailed discussion of the axiom of choice, well ordered sets, and transfinite arithmetic. Second part: versions of axiomatic set theory. The consistency of the continuum hypothesis and the axiom of choice. As time permits, the independence of the continuum hypothesis and the axiom of choice.

10.9B7, 10.9B8 Philosophy of Science and Mathematics I, II (4 q.h. each)

Topics may vary from year to year. Past subjects have included the foundations of statistical inference, the structure of scientific theories and analysis of the conceptual structure of mathematics.

10.9B9 Seminar: Constructive Mathematics (4 q.h.)

10.9C1 Functional Analysis (4 q.h.)

Topological vector spaces, Banach spaces, Hilbert spaces, algebras of operators, representations.

10.9D1 Applied Mathematics I (4 q.h.)

Mathematical modeling of scientific problems: regular and singular perturbation theory; dimensional analysis, qualitative methods in ordinary and partial differential equations. *Prep. Elementary Ordinary Differential Equations.*

10.9D2 Applied Math II (4 q.h.)

Further modelling techniques with emphasis on continuum mechanics: linear and nonlinear diffusion equations.

10.9E1, 10.9E2 Ordinary Differential Equations I, II (4 q.h. each)

Topics in ordinary differential equations. *Prep. Elementary Ordinary Differential Equations.*

10.9E8 Numerical Analysis I (4 q.h.)

Solution to boundary value problems by the finite-element method; formulation of finite elements; application to interpolation, elliptic and parabolic differential equations, and eigenvalue problems; numerical solution of problems on a computer.

10.9E9 Numerical Analysis II (4 q.h.)

Initial value problems: Runge-Kutta and multi-step methods; finite differences and finite elements.

10.9F1 Optimal Control Theory I (4 q.h.)

Linear and nonlinear control problems defined by ordinary differential equations, relaxed controls, existence theorems, Pontryagin's maximum principle.

10.9F3 Optimization (4 q.h.)

Convex sets, linear and nonlinear programming, zero-sum games, dynamic programming, numerical methods.

10.9F6 Computer Science I (4 q.h.)

Mix and Pascal: introduction to machine organization; data structures and algorithms including stacks, recursion, and linked lists. *Prep. knowledge of elementary programming.*

10.9F7 Computer Science II (4 q.h.)

Information structures; vectors and arrays, stacks and queues, linked lists, and trees and graphs; operations on information structures and applications.

10.9F8, 10.9F9 Computer Science III, IV (4 q.h. each)

Systems programming; compilers, assemblers, loaders, and operating systems.

10.901, 10.902 Computer Science V, VI (4 q.h. each)

Topics chosen from automata theory, formal languages, algorithms, and artificial intelligence.

10.9G1 Probability I (4 q.h.)

Introduction to probability; independent random variables; types of convergence; laws of large numbers; characteristic functions; central limit theorem.

10.9G2 Probability II (4 q.h.)

Introduction to stochastic processes; random walk; conditional expectations; Markov processes; multivariate normal distribution; Brownian motion.

10.9H1 Statistics I (4 q.h.)

Parametric families of distributions; testing hypotheses; likelihood ratio tests; estimation and maximum likelihood; regression.

10.9H3 Statistical Decision Theory (4 q.h.)

Subjective probability-utility. Bayesian approach to decision problems, including estimation, testing hypotheses, and linear statistical models. Sequential decisions.

10.9M5 Lie Theory (4 q.h.)

Lie groups and Lie algebras. The exponential map. Examples, basic structure theorems. Representation theory. Applications. Additional topics will vary with the instructor and may include infinite-dimensional Lie algebras, algebraic groups, finite groups of Lie type, geometry and analysis of homogeneous spaces.

10.9Q1 Homological Algebra (4 q.h.)

Basic properties of categories and functors; sums, products, morphisms; Hom, Tensor Product, and their derived functors Ext and Tor; exact sequences, homology and cohomology; homological dimension and co-dimension; applications to algebra and topology.

10.9Q2 Commutative Algebra (4 q.h.)

Prime ideals, localization, integral extensions; primary decomposition; Krull dimension; chain conditions, Noetherian and Artinian modules; additional topics from ring and module theory as time permits.

10.9R7 Introduction to Combinatorial Theory (4 q.h.)

Introduction to enumerative combinatorics. Generating functions. Fibonacci numbers. Multinomial theorems. Recurrence formula. Sterling numbers. Principal of inclusion-exclusion. Ramsey's Theorem and a brief introduction to graph theory.

10.9R8 Combinatorial System Analysis (4 q.h.)

Topics of combinatorial analysis closely related to computer and other finite systems

are studied: Menger's theorem. The theorems of Hall and König t-designs. Latin squares. Difference sets. Steiner triple systems finite geometries. Block designs and algebraic coding. Trees and graphs are discussed with an emphasis on computing algorithms.

10.9R9 Advanced Combinatorics (4 q.h.)

Further topics in combinatorial analysis are studied. These include permutation groups, polya counting theory, lattice theory, matroid theory, advanced graph theory (connectedness, planarity coloring theorems and chromatic polynomials). Emphasis may vary from year to year depending on the interests of the instructor and students. *Prep. 10.9R7 and 10.9R8.*

10.9T1 Algebra III (4 q.h.)

Rings, ideals, factor rings, prime and maximal ideals, principal ideal domains, polynomial rings, unique factorization and Gauss' Theorem, modules, Hilbert Basis Theorem, Noetherian rings and modules, Artin rings, matrix rings, Wedderburn's structure theorem for simple Artin rings, exact sequences, tensor products.

10.9U1 Algebraic Topology (4 q.h.)

Topics from: homology groups, sequences; fiber spaces; sheaves; products in homology and cohomology; cohomology algebra; Kunneth theorems; cohomology operations; Poincaré duality; higher homology groups and the Hurewicz theorem; characteristic classes, spectral sequences.

10.9U4 Differential Geometry (4 q.h.)

Geometry of surfaces in the euclidean space, with the emphasis on the global aspects, using the technique of tensor calculus. Elements of Riemannian geometry, connections. Holonomy.

10.9W1 Dynamical Systems (4 q.h.)

Structural stability and qualitative theory of dynamical systems.

10.9W9 Seminar: Dynamical Systems (up to 4 q.h.)

Topics in dynamical systems as chosen by participants.

10.9Z2 Readings in Analysis (up to 4 q.h. per quarter)

10.9Z3 Readings in Algebra (up to 4 q.h. per quarter)

10.9Z4 Readings in Topology (up to 4 q.h. per quarter)

10.9Z5 Doctoral Dissertation

10.9Z6 Seminar in Analysis (up to 4 q.h. per quarter)

10.9Z7 Seminar in Algebra (up to 4 q.h. per quarter)

10.9Z8 Seminar in Topology (up to 4 q.h. per quarter)

The department offers an assortment of courses under the general heading

"Seminar" (10.9Z6-8). At the outset of each quarter, times for organizational meetings will be posted. At these meetings schedule and content are negotiated. Students and faculty with interest in the specialty of the **Seminar** are encouraged to attend the organizational meeting.



physics

Professors

Roy Weinstein, Ph.D., Massachusetts Institute of Technology, Chairperson
Ronald Aaron, Ph.D., University of Pennsylvania
Petros N. Argyres, Ph.D., University of California, Berkeley
Richard L. Arnowitt, Ph.D., Harvard University
Alan H. Cromer, Ph.D., Cornell University
Marvin H. Friedman, Ph.D., University of Illinois at Urbana
David A. Garelick, Ph.D., Massachusetts Institute of Technology
Marvin W. Gettner, Ph.D., University of Pennsylvania
Michael J. Glaubman, Ph.D., University of Illinois at Urbana
Hyman Goldberg, Ph.D., Massachusetts Institute of Technology
Bernard Gottschalk, Ph.D., Harvard University
Walter Hauser, Ph.D., Massachusetts Institute of Technology
Giovanni Lanza, Ph.D., University of Trieste
Bertram J. Malenka, Ph.D., Harvard University
Pran Nath, Ph.D., Stanford University
Clive H. Perry, Ph.D., University of London
Eugene J. Saletan, Ph.D., Princeton University
Carl A. Shiffman, Ph.D., University of Oxford
Yogendra N. Srivastava, Ph.D., Indiana University
Michael T. Vaughn, Ph.D., Purdue University
Eberhard von Goeler, Ph.D., University of Illinois at Urbana
Fa-Yueh Wu, Ph.D., Washington University

Associate Professors

Robert I. Boughton, Ph.D., Ohio State University
William L. Faissler, Ph.D., Harvard University
Robert P. Lowndes, Ph.D., University of London
J. Edward Neighbor, Ph.D., Massachusetts Institute of Technology
Jeffrey B. Sokoloff, Ph.D., Massachusetts Institute of Technology
Allan Widom, Ph.D., Cornell University

Assistant Professors

Arun Bansil, Ph.D., Harvard University
David L. Johnson, Ph.D., University of Chicago
Michael L. Mallery, Ph.D., California Institute of Technology
Fernando D. Medina, Ph.D., Princeton University
Neal E. Tornberg, Ph.D., Massachusetts Institute of Technology

Research Associates

Ronald S. Longacre, Ph.D., University of California, Berkeley
Jorge H. Moromisato, Ph.D., Northeastern University
Joseph E. Sacco, Ph.D., Northeastern University
Maurice F. Tautz, Ph.D., Northeastern University

Admission

Applicants for admission must have had, in addition to the requirements of the college, an undergraduate program which includes at least 12 semester hours of upperclass physics (beyond general physics) and courses in calculus and ordinary differential equations.

Students planning to enter graduate school should have in their upper-class undergraduate program the following courses or their equivalent:

11.200	Mechanics
11.211 - 11.212	Electricity and Magnetism
11.220 - 11.230	Thermodynamics, Kinetic Theory and Modern Physics
11.240	Quantum Mechanics

Students must also take courses in advanced calculus, functions of a complex variable, fourier series and boundary value problems. (The numbers correspond to Northeastern courses.) Students whose background in one or more of these areas is weak will be asked to satisfy the prerequisites to the required courses by taking up to 9 quarter hours of introductory courses.

All students admitted to the program must be interviewed by a departmental adviser and arrangements for a program of study must be concluded before registration.

The Program

All graduate students are expected to complete a core curriculum which consists of the 30 quarter hours of courses specifically required for the M.S. degree (see below), together with the additional course requirements for the appropriate degree.

The well-prepared full-time student can plan to complete this core curriculum in one year, and the required courses for the Ph.D. degree in two years. A less well-prepared full-time student can expect to complete the core curriculum and the additional requirements for the M.S. degree in two years, and the required courses for the Ph.D. in three years.

The part-time student can expect to complete the requirements for the M.S. degree in four years at the rate of one course (3 or 4 hour) per quarter, or sooner either by taking courses in the summer, or by taking a second course in some academic years.

THE MASTER OF SCIENCE DEGREE

Course Requirements

Forty-two quarter hours (q.h.) of graduate credit are required, of which up to 12 q.h. may be transfer credit on departmental approval, and up to 9 q.h. may be in introductory courses.

The following courses are required, for a total of 30 q.h. of graduate credit:

11.81A, 11.81B	Mathematical Methods A,B,	(4 q.h.)
11.82A	Classical Mechanics	(4 q.h.)
11.834, 11.835	Electromagnetic Theory A,B	(3 q.h.)
11.841, 11.842, 11.843	Quantum Theory A,B,C	(4 q.h.)

The remaining 12 q.h. may be chosen from any courses carrying graduate credit in physics, mathematics, engineering, chemistry, psychology, or biology, for which the student has adequate preparation.

Sample Programs for Part-time Students

YEAR	F	W	Sp	F	W	Sp
I	11.81A	11.81B	11.82A	Elective	11.240	11.241
II	11.834	11.835	11.836	11.81A	11.81B	11.82A
III	11.841	11.842	11.843	11.834	11.835	11.836
IV		Electives		11.841	11.842	11.843

THE DOCTOR OF PHILOSOPHY DEGREE

Admission

A student's eligibility to take the Ph.D. qualifying examination is decided by a committee of the department on the basis of the student's overall performance. Full-time students will be notified of their status sometime in their second year of study. Students enrolled in the part-time master's degree program who wish to qualify for Ph.D. candidacy may so indicate by petition to the graduate committee of the department. The petition should include a timetable for completing the additional required courses listed below and for taking the qualifying examination.

Course Requirements

The following courses are required in addition to the required courses for the M.S. degree:

11.827, 11.828, 11.829	Statistical Physics A,B,C	(3 q.h.)
11.836	Electromagnetic Theory C	(3 q.h.)
11.848	Advanced Quantum Theory	(4 q.h.)
11.86A, 11.86B, 11.86C	Particle and Nuclear Physics A,B,C	(3 q.h.)
11.87A, 11.87B	Solid State Physics A,B	(4 q.h.)

Transfer credit for courses taken at other universities may be granted at the discretion of the department.

Sample Programs for Full-Time Ph.D. Students

YEAR	F	W	Sp	F	W	SP
I	11.81A	11.81B	11.82A	Elective	11.240	11.241
	11.834	11.835	11.836	11.81A	11.81B	11.82A
	11.841	11.842	11.843	11.834	11.835	11.836
II	11.827	11.828	11.829	11.841	11.842	11.843
	11.848	11.87A	11.87B	11.827	11.828	11.829
	11.86A	11.86B	11.86B	Electives		
	Qualifying Exam					
III	Thesis Research and Advanced Electives			11.848	11.87A	11.87B
				11.86A	11.86B	11.86C
				Electives		
				Qualifying Exam		
IV, V	Thesis Research and Advanced Electives					

Qualifying Examination

The Ph.D. qualifying examination, which consists of a written part and an oral part, is given twice a year, once in September and once in January. The written examination covers the material in the courses required for the Ph.D., and must be taken no later than the September following completion of these required courses. If the examination is failed, it may be repeated once only on the next occasion it is given.

Residence Requirement

A student who has completed the required 63 q.h. of course work and has passed the qualifying examination, becomes a doctoral degree candidate and must satisfy the residence requirement by one year of full-time graduate work.

Teaching Requirement

Some teaching experience is required. This requirement may be satisfied by at least one year of service as a teaching assistant or by suitable teaching duties.

Work-Study Option

A Ph.D. candidate may spend one year in a participating industrial or government laboratory immediately after passing the Ph.D. qualifying examination. In this program, the student will remain in touch with the University by taking one course per quarter at the University, and by frequent contact with an assigned faculty adviser. After the one-year internship, the student will return to the University to do the dissertation.

Eligibility for this program is contingent on acceptance both by the department, and by the external laboratory involved.

Dissertation

The student should arrange for a dissertation adviser prior to taking the oral part of the qualifying examination. An outline of the dissertation must be approved by the departmental graduate committee at least eight months before the final dissertation examination (see below).

The student may choose a field of research according to one of the following options:

- a) In one of the research areas in the department, under direct supervision of the adviser.
- b) In one of the other research areas of the University, under the direct supervision of a researcher in that field. In that case, a joint committee including the direct supervisor, the departmental adviser, and one other member of the department will constitute the thesis committee.
- c) In an area of applied research in one of the industries or non-profit institutions associated with the department's Industrial Ph.D. Program. The direct supervisor will be an employee of the institution where the research is done (and will have been accredited by the physics department); the rest of the thesis committee will be as in option (b) above.

Final Dissertation Examination

This examination will be held in accordance with the graduate school regulations.

AREAS OF ADVANCED STUDY AND RESEARCH

Theoretical Particle Physics

Research interests cover a range of topics, including unified gauge theories of weak, electromagnetic, and strong interactions, supersymmetry, supergravity, quantum field theory, phenomenology of high-energy processes, quark models, and relativistic three body phenomenology.

Experimental High Energy Physics

Several experiments are currently in progress at the Fermi National Accelerator Laboratory (FNAL) to explore the hadron mass spectrum from 2 to 15 GeV, using missing and effective mass techniques.

A large effort is devoted to building a magnetic calorimeter (MAC) to be used for detecting particles from the electron-positron colliding beam facility (PEP) now under construction at Stanford. The first experiments with this detection are scheduled to begin in late 1979.

Theoretical Solid State Physics

The research interests of this group cover problems such as transport theory, Raman scattering, electromagnetic and elastic properties of solids, magnetism, Fermi liquid theory, optical properties of metals, low temperature physics, scattering theory for many-body systems, phase transitions, quantum optics, statistical mechanics, and many-body problems.

Experimental Solid State Physics

Experiments by workers in this area study topics such as the thermodynamics of superconductivity and other low temperature phenomena, radio frequency size effects, transport properties of pure metals and dilute alloys, optical properties of solids, Raman spectroscopy, collective oscillations in solids, and high pressure physics.

Research Facilities and Equipment

The main facilities of the department are located in the Dana Research Center, a modern building with ample library facilities; research laboratories, a central machine shop, an electronics shop, conference rooms, and offices for faculty and graduate students. Solid-state experimental research is carried out in laboratories in the Dana Center. High-energy experimental research is carried out at various national laboratories, including the Fermi National Accelerator Laboratory near Chicago, and the Stanford Linear Accelerator. Construction of equipment and data analysis are done at Northeastern.

The Northeastern University Computation Center has a CDC Cyber 72 central processor and operates a quick-batch system with immediate turn around for debugging and running short programs. The department also has a terminal in the Dana Center for time-sharing access to the system.

DESCRIPTION OF COURSES

I. INTRODUCTORY COURSES

11.220 Thermodynamics and Kinetic Theory (3 q.h.)

First and second laws of thermodynamics. Entropy and equilibrium. Thermodynamic potentials. Elementary kinetic theory. Elementary statistical mechanics and the statistical interpretation of entropy.

11.240 Quantum Mechanics I (3 q.h.)

The first of a two-quarter sequence in quantum mechanics. Observations of macroscopic and microscopic bodies. The uncertainty principle, wave particle duality, probability amplitudes, Schrodinger wave theory, and one-dimensional problems. *Prep. 11.208 or equiv.*

11.241 Quantum Mechanics II (3 q.h.)

Continuation of 11.240. Discrete and continuous states, Schrodinger equation in three dimensions, angular momentum, general theory of quantum mechanics, application. *Prep. 11.240.*

11.282 Introduction to Solid State Physics (3 q.h.)

Semi-classical treatment of the thermal, magnetic, and electrical properties of crystalline solids. Among the topics which may be discussed include: X-ray diffraction and the reciprocal lattice, elasticity and lattice vibrations, specific heat, properties of insulators, magnetism in insulators and metals; band theory of metals. *Prep. 11.220 and 11.230 or equiv.*

11.285 Introduction to Nuclear Physics (3 q.h.)

Nuclear structure, nuclear masses, radioactivity, nuclear radiation, interaction of radiation and matter, detectors, fission, nuclear forces, elementary particles. *Prep. 11.230 or equiv.*

11.846, 11.847 Electronics and Data Analysis I, II (4 q.h.)

A two-quarter course intended to teach those electronic and data-analysis techniques that are common to research in all fields of experimental physics. Subjects in electronics will be: principles of semiconductor devices; analog techniques including feedback and servo loops, and wide-band amplification; digital techniques including integrated circuits and logic techniques; design of electronic subsystems such as counters, analog-to-digital converters and phase-sensitive detectors. Subjects in data analysis will be probability theory; distribution functions; fitting data with a hypothesis; error estimation. Time permitting, high-vacuum techniques, cryogenic techniques, and lasers may also be covered.

11.871 Radiation Physics (2 q.h.)

Introduction to atomic and nuclear physics for graduate students in biology and pharmacy. Topics include quantum mechanics and atomic structure, nuclear structure, radioactivity, properties of nuclear radiation, detection of radiation.

11.872 Radiation Biology and Health Physics (2 q.h.)

The effects of radiation on biological systems and the uses of radiation in medicine and biological research. Topics include dosimetry, effects of radiation on chemical reactions; effects of radiation on cells, organs, and individuals; theories of radiation damage; imaging and tracer techniques using radiopharmaceuticals; radiation safety and standards. *Prep. 11.871.*

II. REQUIRED REGULAR COURSES (Offered every year)**11.81A, 11.81B Mathematical Methods A, B** (4 q.h.)

Calculus of variations. Euler Lagrange equations. Theory of functions of a complex variable. Analytic functions. Taylor and Laurent series. Analytic continuation and classification of functions. Calculus of residues. Asymptotic series. Dispersion relations. Applications to ordinary differential equations and the study of special functions. Finite and infinite dimensional vector spaces. Linear operators. Function spaces and generalized Fourier expansions. Green's functions.

11.82A Classical Mechanics (4 q.h.)

Generalized coordinates and Lagrangian formulation of mechanics, conservation laws. One dimensional and central force problems. Collision theory. Rigid bodies. Hamiltonian formulation and the canonical formalism.

11.827 Statistical Physics A (3 q.h.)

The phenomenological theory of thermodynamics. Fundamental relations and ther-

modynamic potentials. Extremal principles of thermodynamics. Applications to simple systems. Stability conditions. Phase transitions. Thermodynamics of electric and magnetic systems. Principles of irreversible thermodynamics. *Prep. 11.82A and 11.841 (concurrently.)*

11.828, 11.829 Statistical Physics B, C (3 q.h.)

The principles of statistical mechanics and statistical thermodynamics. Density matrix. Theory of ensembles. Derivation of the laws of thermodynamics. Fermi-Dirac and Bose-Einstein statistics. Application to gases, liquids, and solids. Theory of phase transitions. Second-quantization formalism for interacting systems. Cooperative phenomena. *Prep. 11.827, 11.841.*

11.834, 11.835, 11.836 Electromagnetic Theory A, B, C (3 q.h.)

Maxwell's equations. Static field and boundary value problems; multipole expansion. Phenomenology of dielectrics, conductors, and magnetic materials. Faraday's Law. Energy and momentum; Poynting vector; Maxwell stress tensor. Plane waves; polarization. Reflection and refraction; diffraction. Relativity. Radiation from sources. Motion of charged particles in electromagnetic fields; magnetic mirrors, particle accelerators. Introduction to plasma physics; magnetohydrodynamics. Radiation from accelerated charges; bremsstrahlung, synchrotron radiation. Scattering of radiation; interaction of radiation with matter. *Prep. 11.212, 11.81A (concurrently).*

11.841, 11.842, 11.843 Quantum Theory A, B, C (4 q.h.)

Experimental basis of quantum theory. Schrodinger equation and probability interpretation of wave mechanics. Uncertainty principle. Application to one dimensional problems, the harmonic oscillator, orbital angular momentum, and the central force problem. Quantum theory of scattering. Born approximation. Phase shift analysis. Introduction to S-matrix theory. General formulation of quantum mechanics in Hilbert space. Spin. Identical particles and symmetrization principle. Time-independent and time-dependent perturbation theory. Semi-classical theory of radiation and atomic spectra. Addition of angular momentum. Wigner-Eckart theorem. Quantum theory of radiation. Absorption, emission, and scattering of photons. *Prep. 11.240 or equiv.*

11.848 Advanced Quantum Theory (4 q.h.)

Introduction to the formulation of a relativistic quantum theory. Study of the Dirac equation and its Lorentz covariance. Plane wave solution of the Dirac equation, and projection operators. Bound state solutions of the Dirac equation in a Coulomb field, and the hydrogen atom. Parity, charge conjugation, and time reversal symmetries. Propagator theory. *Prep. 11.843.*

11.86A, 11.86B, 11.86C Particle and Nuclear Physics A, B, C (3 q.h.)

The first quarter is a study of nuclear physics with emphasis on the nature of nuclear forces and its connection to particle physics. Phenomenological models are examined and compared with experimental results. The second and third quarters are a study of elementary particles and their interactions. A basic classification of elementary particles is made, along with a summary of their strong, weak, and electromagnetic interactions. Lorentz invariance and other symmetry principles are used to extract theoretical statements about scattering and decay amplitudes, and particle mass spectra. *Prep. 11.843, 11.848 (concurrently).*

11.87A, 11.87B Solid State Physics A, B (4 q.h.)

Adiabatic approximation and theory of lattice vibrations of perfect crystals. Phonons, polaritons, and their measurement. One-electron approximation of solids and theory of Bloch electrons. Metals, semiconductors, and insulators. Thermal properties. Bloch electrons in external fields. Electron-phonon interaction. Electrical and thermal conductivity. Theory of transport phenomena. Magnetic properties. Amorphous solids. *Prep. 11.827, 11.842.*

III ADVANCED ELECTIVES**11.804, 11.805, 11.806 Advanced Solid State Physics A, B, C (4 q.h.)**

Selected advanced topics in the theory of solids to be chosen each time by the interested students and instructor. E.g.: Theory of normal metals. Hartree-Fock and Random phase approximations. Optical and transport properties. Solid-state plasmas. Raman spectroscopy. Quasiparticles and collective excitations. Quantum solids. Amorphous solids, etc. *Prep. 11.829, 11.843, 11.87B.*

11.817 Foundations of General Relativity

The course discusses the physical basis underlying relativity (the weak and strong principle of equivalence), the role of the metric tensor as a carrier of gravitational information, and the modification of the Lorentz covariant field equations in the presence of gravitation. An introduction to Riemannian geometry is given, and the Einstein field equations and tests of Einstein's theory are discussed. *Prep. 11.81B, 11.82A, 11.836, and 11.843.*

11.818 Relativistic Astrophysics and Cosmology

The course deals with the equations for the relativistic stellar system, white dwarfs, neutron stars and properties of pulsars, gravitational collapse and black holes, quantum radiation from black holes, super heavy stars as possible quasar energy sources, quantum effect in gravitational collapse, the metric for cosmological systems, and the big bang theory. *Prep. 11.817 and 11.848.*

11.819 Quantum Gravity

The course deals with gravitation as a quantum field, threshold properties of gravitational quantum S-matrix, quantization leading to a set of Feynman rules, calculations of simple tree diagrams, closed loop infinities and the problem of renormalizability of quantum gravity. *Prep. 11.818.*

11.857, 11.858, 11.859 Many-Body Theory A, B, C (4 q.h.)

Introduction to some many-body problems and the required mathematical techniques. Theory of linear response and correlation functions. Landau's theory of Fermi liquids and applications to solids. Theory of superconductivity and superfluidity. General theory of Green's functions and diagrammatic techniques. *Prep. 11.829, 11.843, 11.87B.*

11.854, 11.855, 11.856 Fields, Particles, and Currents A, B, C (4 q.h.)

Introduction to a local field theory. Symmetries of the Lagrangian and conservation laws, Lorentz group, spin, and helicity. P, C, and T. Klein-Gordon, Dirac, vector meson and photon fields. The S-matrix and LSZ reduction formulae. Spectral representations. Feynman diagrams. Green's functions at large Euclidean momenta. Renormalization and finiteness. The renormalization group and asymptotic freedom.

Gauge theories, spontaneous breaking and Higgs phenomenon. Weinberg's unified theory of weak and electromagnetic interactions. Currents. *Prep. 11.848.*

11.91A, B, C (1 q.h.)

11.92A, B, C (2 q.h.)

11.93A, B, C (3 q.h.)

11.94A, B, C (4 q.h.)

Reading course, or theoretical or experimental work under individual faculty supervision. *Prep. Consent of faculty member.*

11.995 Doctoral Dissertation

Experimental and theoretical work for Ph.D. candidates.

political science

Professors

- Robert L. Cord, Ph.D., Maxwell School of Citizenship and Public Affairs, Syracuse University
Walter S. Jones, Edward W. Brooke Professor, Ph.D., Fletcher School of Law and Diplomacy, Tufts University
David E. Schmitt, Ph.D., University of Texas
R. Gregg Wilfong, Ph.D., Harvard University

Associate Professors

- L. Gerald Bursey, Ph.D., Harvard University
Robert E. Gilbert, Ph.D., University of Massachusetts
Minton F. Goldman, Ph.D., Fletcher School of Law and Diplomacy, Tufts University
Steve Worth, Ph.D., University of Washington

Assistant Professors

- Edward M. Humberger, Ph.D., University of North Carolina
Eileen McDonagh, Ph.D., Harvard University
Suzanne Ogden, Ph.D., Brown University
Joseph Reed, Ph.D. Candidate, University of Wisconsin
Roberta P. Rosenberg, Ph.D. Candidate, Maxwell School of Citizenship and Public Affairs, Syracuse University
George G. Wolohojian, Jr., Ph.D. Candidate, Maxwell School of Citizenship and Public Affairs, Syracuse University

Adjunct Faculty

- Lillian Bloom, Ph.D. Candidate, Boston University
Edward F. Boyle, S.J., M.B.A., Amos Tuck School of Business Administration
Thomas J. Cahill, B.S., Syracuse University
Ernest W. Cook, Ph.D., Ohio State University
Michael J. Coury, M.A., Boston University
Oleta L. Crain, M.P.A., Northeastern University
Maxim M. Dem'chak, M.P.A., Northeastern University
Cynthia J. M. Finch, Ph.D. Candidate, Brandeis University
Laurence D. Fitzmaurice, B.S., Babson College
Kevin T. Fitzpatrick, M.B.A., Boston College
Richard M. Gladstone, M.C.P., University of Cincinnati
Robert A. Hankin, Ph.D., Northeastern University
James T. Hilliard, J.D., Suffolk University
Edward D. Kalman, J.D., Suffolk University
Nancy K. Kaufman, M.S.P., Boston College
Paul Keough, M.P.A., Northeastern University
Ronald E. Lawson, M.P.A., Northeastern University

Evelyn B. Levin, M.P.A., Northeastern University
 Marilyn S. Lloyd, M.C.P., Yale University
 Robert H. McClain, M.P.A., University of Denver
 William D. McLaurin, Ph.D., New York University
 James A. Medeiros, Ph.D., University of Maryland
 Walter W. Mode, M.A., University of Minnesota
 Richard B. Morrison, Ed.D., Boston University
 Stanley F. Moss, M.C.P., Massachusetts Institute of Technology
 Lance A. Neumann, Ph.D., Massachusetts Institute of Technology
 Robert J. M. O'Hare, M.S., Boston University
 Melvin E. Scovell, M.B.A., Columbia University
 Marvin Siflinger, M.P.A., Syracuse University
 Wallace E. Stickney, M.S., Northeastern University
 Nancy R. Turak, M.S.P., Boston College
 John S. Warren, M.B.A., Boston College
 Stephen M. Weiner, LL.B., Yale University

Admission

In addition to the admission requirements listed on page 14, applicants for the Master of Arts program should have a background which includes at least 6 semester hours of political science, government, or related courses. TOEFL scores are required for foreign-born full-time applicants.

Applicants for the Master of Public Administration program should demonstrate a clear and strong interest in public administration. All applicants for admission must furnish a statement that supports his or her interest in public administration and provides reasons for wishing to enter this program. Although it is anticipated that most candidates for this program will come with a major concentration in the social sciences, this is not mandatory, and applicants from other fields such as engineering, law, the sciences, and business administration will be considered for candidacy.

All applicants to Political Science graduate programs, including persons seeking special, non-degree status, must follow regular admissions procedures.

THE MASTER OF ARTS DEGREE

Program

Forty quarter hours of academic work are required. With the approval of the faculty adviser, a maximum of nine quarter hours may be elected from graduate courses in other departments and a maximum of eight quarter hours may be elected from advanced undergraduate courses.

A thesis is optional with the approval of the chairperson of the department. If approved, a thesis carries six quarter hours of credit.

Comprehensive Examination

This examination will be held in accordance with the general graduate school regulations. Every candidate for the degree must pass examinations in two fields as prescribed by the department. Degree candidates are limited to two attempts at successful examination in each field. Choice may be made from the following fields: American Government, Comparative Government, International Relations, Political Theory, and Public Administration.

THE MASTER OF PUBLIC ADMINISTRATION DEGREE

Program

Forty-two quarter hours of academic work are required. All students must complete the following six courses:

- 22.871 Public Finance and Budgeting
- 22.880 Survey of Public Administration
- 22.882 Public Personnel Administration
- 22.928 Organization Theory and Management
- 22.970 Methods for Public Administration I
- 22.971 Methods for Public Administration II

At least five additional courses must be selected from courses designated public administration electives. Not more than four courses may be selected from other graduate courses offered by the department or the University, and these must have the approval of the faculty adviser except for those offered by the Department of Political Science.

All students beginning the M.P.A. program who have not had an introductory American government course at the undergraduate level are required to take 22.800 Seminar in American Government. Students entering the program who have not completed an undergraduate-level course in economics are required to take 39.9F4 Economics for Public Administrators.

M.P.A. Concentrations

Students may elect to declare an M.P.A. concentration after completing core courses. Concentration areas include: (1) Public Organization and Management, (2) Public Finance and Budgeting, (3) Public Personnel Administration, (4) State and Urban Government, and (5) Policy Sciences. The concentrations seek to provide integrated course offerings in key public administration fields. Each concentration area is coordinated by a full-time faculty member, who also serves as adviser to students in his or her area of concentration. There are four required courses in each concentration as well as a variety of electives which may be selected based on professional or academic interests.

Qualifying Examination

All students are required to complete a written qualifying examination after the completion of eight courses, including the six core courses. Degree candidates are limited to two attempts at successful completion of the Qualifying Examination.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

All courses are seminars.

22.800 American Government

Analysis in depth of selected problems in American government. Examples of problems are: transition of American political parties, legislative reapportionments, and the decline of Congress as a law-making body. *M.P.A. elective.*

22.805 Scope and Methods of Political Science

This course is designed as an in-depth examination of the assumptions, principles, etc. that underlie contemporary political science. As such it invites the student to consider the present practice of the discipline in the light of its history and to critically evaluate the discipline in the interest of a greater understanding of nature and limits.

22.810 Models of Political Systems.

A detailed examination and critique of current models of political systems.

22.812 Political Psychology and Socialization

An examination of theories of political psychology, opinion formation and attitude change; of political ideology; of processes of individual political development and socialization; of effects on mass and elite political behavior; of attitudinal differences and differential socialization experiences; of individual political behavior and the political system.

22.815 Politics and the Mass Media

Study of the role of mass media in the formation of public opinion, with special attention given to media usage in the electoral process.

22.820 Legislative Process

Study of Congress and of the influence of the President, administrative bureaucracy, parties, interest groups, and public opinion on the development of legislative policy. Comparisons will be made with legislative process in the states. *M.P.A. elective.*

22.821 Theories of American Political Participation

This course will examine political behavior at both the national electorate level and at the level of legislative roll call voting, analyzing the relative impact of demographic and attitudinal components as well as the effect of constituency and partisan identification upon legislative behavior.

22.822 American Constitutional Law

Employing excerpts of U.S. Supreme Court decisions and other primary legal materials, this course examines the constitutional rationale for judicial review;

various philosophical approaches to the exercise of judicial power; and the scope of judicial authority to settle questions challenging the legitimacy of governmental actions in the American constitutional system.

22.823 American Constitutional Law II

Using excerpts of primary legal materials, this course builds upon the judicial doctrines developed in 22.822 and specifically examines the constitutional theories behind the growth of congressional prerogatives in economic and social affairs, and expanding presidential power in internal and foreign matters. *Prep. 22.822 or consent of the instructor.*

22.824 The Presidency

An analytic treatment of the constitutional and extraconstitutional powers of the contemporary president; an examination of the place and function of the chief executive in the formulation and execution of public policy. *M.P.A. elective.*

22.826 American Electoral Behavior

The theoretical and methodological assumptions of election studies of the American political system will be analyzed and the substantive conclusions carefully reviewed.

22.828 The Judiciary

Analysis of the role of the judiciary in the American governmental process. Special attention is given to those areas of constitutional law where the Court's decisions have a profound impact on the basic structure of American politics (apportionment, economic regulation, federalism, etc.).

22.829 Political Parties, Pressure Groups and Public Policy

A study of the role of parties and pressure groups in the policy making process; trends in contemporary party politics will be examined as well as behavior patterns of the American electorate.

22.830 Civil Rights

Examination of the doctrine of constitutionalism illustrated and amplified by a study of the substance and process of the Bill of Rights as developed in decisions of Federal courts, and Congressional enactments.

22.831 Procedural Due Process

Utilizing excerpts from U.S. Supreme Court decisions and other legal materials, this course examines the philosophical and constitutional relationships between Amendments 4, 5, 6, 8 and the Fourteenth Amendment. The substance of the right to fair trial, counsel, confrontation, protection against self-incrimination and unreasonable searches and seizures are among the many procedural rights examined through the decisions of the Roosevelt, Vinson, Warren, and Burger Courts.

22.832 Intergovernmental Relations

An institutional-behavioral analysis of the changing relationship between the various levels of American government — national, state, and local — relating the pattern of change to the social and economic forces which underlie it. *M.P.A. elective.*

22.834 Constitutional Law in Public Administration

An introduction to American Constitutional Law and the Federal system using case

materials and emphasizing principles of importance to public administrators, including such constitutional concepts as separation of powers, judicial review, dual federalism, legislative investigating power, executive impoundment, federal preemption and the appointment and removal power. *M.P.A. elective.*

22.838 Administrative Ethics in Public Management

An analysis of ethical problems in American public administration including discussion of ethical dilemmas frequently faced by public managers. *M.P.A. elective.*

22.840 State Government

Appraisal of the problems of contemporary state government in the U.S. Particular emphasis is given to the state government of Massachusetts. Individual research is stressed. *M.P.A. elective.*

22.841 Problems in Urban Planning

An exploration of the devices available to the urban planner for policy implementation, including zoning, subdivision regulation, and capital improvement programs. Special emphasis is given to the planning of individual sites. *M.P.A. elective.*

22.842 Techniques of Urban Planning

A study of the history and techniques of city planning, stressing the elements of planning. *M.P.A. elective.*

22.843 Politics of State and Urban Planning

An investigation of the relationships of planning to other governmental functions with stress on practical processes, particularly at the municipal government level. *M.P.A. elective.*

22.844 Urban Government

The contemporary crisis in urban government — problems of political independence, government finance and administration, rapid growth of suburban and metropolitan areas, and decline and decay of the core city are stressed. Particular emphasis is given to the Boston metropolitan area. Individual research is stressed. *M.P.A. elective.*

22.847 Transportation Policy

Examination of the role of politics, governmental mechanisms and public policy in the transportation planning process. Particular attention is given to political interest groups and the manner in which they affect transportation policy on the federal, state and local levels. *M.P.A. elective.*

22.848 Problems of Community Development

Examination of the role of government, politics and public policy in the urban process and related problems in the United States. *M.P.A. elective.*

22.850 Comparative Politics I

Comparative analysis of politics and political systems with special attention to fundamental problems of theory and practice. The chief focus is on contemporary political systems and contemporary theories in the field of comparative politics. Traditional models are also treated, but more briefly. Particular attention will be paid to British and American political experience.

22.851 Comparative Politics II

Extends and intensifies the comparative analysis of politics undertaken in Comparative Politics I by examining a broader range of institutional experience. Special attention will be given to European political experience, particularly that of France and Germany. *Prep.* 22.850.

22.852 European Political Parties

A comparative cross-national study of political organization and behavior in England, France, and Germany with emphasis on party leadership, strategy, organization and constituency as well as socialization, recruitment, and participation of voters.

22.853 Crisis Politics in Democracies and Dictatorships

Analysis of governmental response to crises and emergencies. Consideration of such topics as war powers, riots and rebellions, martial law, transfer of regime, succession problems, economic crises, presidential emergency powers, national security powers, executive privilege, impeachment, etc.

22.854 Totalitarianism

An analysis of totalitarianism and dictatorship including study of historical background; fundamental characteristics; theories of origin, nature, and significance; and evaluation of techniques, ideologies, policies, and instruments of power. Special attention will be given to the government and politics of the Soviet Union.

22.855 Government and Politics in Germany

A study of political culture, federalism, and executive-legislative relations on the national level with a view to appraising the quality and durability of the present democratic system.

22.856 Government and Politics of France

A study of governmental organization and political behavior in France today. Special attention is given to the role of the presidency, executive-legislative relations, and the political party system.

22.857 European Legislative Systems

A comparative analysis of the legislatures in Britain, France, and Germany with emphasis on patterns of historical development, functions, internal organization and relations with the executive.

22.858 Government and Politics of the United Kingdom of Great Britain and Northern Ireland

An analysis of government organization and political behavior in the United Kingdom. Special attention will be given to executive-legislative relations, the political party system, and the politics of Northern Ireland.

22.859 European National Executives

A comparative cross-national study of executive decision making in England, France, and Germany with emphasis on varying patterns of presidential and cabinet authority as well as relationships with the legislature.

22.860 Collective Bargaining in the Public Sector

Study of the mechanisms for labor relations in federal, state and local government

with its impact on the public manager. Emphasis is placed upon collective bargaining processes, tactics, and techniques. *M.P.A. elective.*

22.863 Management Information Systems

The course studies the life cycle of a management system through its three phases: (1) study and design; (2) implementation; and (3) operation within the target organization. It will explore the impact which management information systems have and may in the future have on governmental managers, on their professional environment, and on the society which they serve. Various government MIS will be studied. The course requires no mathematical or data processing background. *M.P.A. elective.*

22.865 Computers and Public Administration

A general orientation to the computer, its uses and operation, with particular attention to programming analysis, preparation and coding, and use of computer programs specifically written for governmental applications. *M.P.A. elective.*

22.868 Health Care Administration

An examination of the politics and administration of health services delivery systems, including a discussion of current topics in health care administration and politics (e.g. national health insurance, health maintenance organizations, physician assistants, citizen participation, administrative decentralization), and an introduction to current developments in policy evaluation methodology and health services research. *M.P.A. elective.*

22.869 Housing and Community Development

Introduces the student to two major urban social policy issues and explores them in terms of their political, economic, and social dimensions. Specific programs and issues in the metropolitan and New England region will be evaluated. *M.P.A. elective.*

22.871 Public Finance and Budgeting

Emphasizes the public budgeting function in its relationship to other functions of public administration. Business budgeting in contrast with public, conflicting legislative, and executive interests are examined; illustration is given of the budget cycle and the mechanics of budget preparation; attention is given to means for improving budget decision-making and administration with use of quantitative and other methods. *M.P.A. core course.*

22.872 Public Fiscal Management

A study of the interrelationships in public administration between systems of finance and the achievement of program objectives. Emphasis is placed upon those aspects of the budgetary process that bear on fiscal policy and appropriations. *M.P.A. core course.*

22.874 Functions and Techniques of Public Management

An introduction to problems in public management and techniques for dealing with them. This will include functions of middle management, supervision, administration of staff activities (e.g. planning, personnel, budget), organization and methods, public relations, managerial use of computer-based techniques, and tactics and strategies of management. *M.P.A. elective.*

22.877 Environment and Energy Policy

Consideration of the legal, political, administrative, and intergovernmental factors involved in the formulation of public policy and the exercise of public power in regulating the use of the environment. Individual research is stressed. *M.P.A. elective.*

22.880 Survey of Public Administration

Introduction to the literature and the major topics in public administration with special attention given to the interrelationships of politics and administration. *M.P.A. core course.*

22.882 Public Personnel Administration

Technique, practice, and organization of personnel functions in public administration, including recruitment, compensation, training, discipline, and relations with employee organizations. *M.P.A. core course.*

22.883 Comparative Public Administration

A comparative study of the approaches to public administration in selected democratic governments in the United States and Europe. *M.P.A. elective.*

22.888 Federal Administrative Law

Study of rule-making, adjudication (formal and informal), administrative finality and judicial review, administrative procedure, scope of administrative powers, and enforcement techniques. *M.P.A. elective.*

22.889 Governmental Accounting

Examination of principles and procedures involved in governmental accounting. *M.P.A. elective.*

22.892 Techniques of Policy Analysis

The purpose of this course is to familiarize the student with various techniques useful in analyzing public policy issues. Case studies of specific applications of such methods as modeling, simulation, and survey research will be examined. *M.P.A. elective.*

22.894 Techniques of Program Evaluation

A review of the various methods used to assess public policy including identification and categorization of outcome, input and program operation variables; and the types of research designs and the steps needed to institute program change after completion of an evaluation study. *M.P.A. elective.*

22.896 Management Planning for Public Organizations

A review of the growth of the planning approach to public management and of its application in specific agencies. Topics include organization of the management planning function, budget planning and methods of providing planning forecasts. *M.P.A. elective.*

22.898 Organizational Psychology and Behavior

The primary objective is to familiarize the student with the literature, theories and concepts of administrative behavior as it has evolved, and then to focus on the development of self-awareness and the building of interpersonal skills. *M.P.A. elective.*

22.899 Human Resources Policy and Administration

Discussion of the origins and development of the Social Security Public Assistance Income Maintenance and various health care programs. The course content will focus on controversial public policy issues of retirement, survivors, disability insurance, aid to families with dependent children, medicare and medicaid. The objective of the course is to develop understanding of the push and pull of many different viewpoints involved in public policy development. *M.P.A. elective.*

22.900 Ancient and Medieval Political Thought

The development of political thought from Greek antiquity to the end of the Middle Ages. Both historical and analytical approaches will be utilized. Attention is also paid to the cultural, social, and intellectual context within which political theories develop.

22.901 China in Revolution

Addresses the problems faced by a revolutionary China in forming new attitudes, instituting a revolutionary political culture, and reconstructing and developing a country on the basis of a revolutionary ideology. Shows how the party, state, military, education, health, science, and medicine have been modified since 1949 to ensure the continuation of a revolutionary polity.

22.906 Position Management

An examination of the bases of position classification at the state, federal and local levels. After reviewing the process of job analysis the course will emphasize several classification schemes, including the new Federal factor benchmark system. Final topics will include wage and salary administration. *M.P.A. elective*

22.908 Manpower Policy and Administration

Introduces the student to human resource policy and management issues within a broader context of social policy. It will investigate specific manpower programs and current issues of importance to the administrator. *M.P.A. elective.*

22.910 Modern Political Thought

Examination of political thought from Machiavelli to Marx.

22.912 Regulatory Administration

This seminar is designed to provide the public manager with a conceptual and historical overview of the development of regulatory policy and mechanisms. It will focus on issues at the public-private interface as well as evaluating the practical implications of government intervention. Finally the seminar will evaluate the political, economic, and administrative effects of a non-regulatory vs. regulatory approach to public management. *M.P.A. elective.*

22.913 Group Dynamics

Based upon an introductory understanding of organizational psychology and behavior, this seminar focuses on the human problems public managers face in their daily work life. Using a group dynamics format, each participant will have the opportunity to integrate the literature in organizational psychology, work issues, and personal growth concerns. *M.P.A. elective.*

22.918 Civil Liberties in Public Administration

Discussion of First Amendment rights as they impact upon the public sector. Refer-

ring to appropriate court cases, topics will include employee rights and obligations with respect to freedom of speech, freedom of association, loyalty oaths, professional certification, as well as legislative investigatory powers. *M.P.A. elective.*

22.919 Political Economy of Public Administration

A central concern of this course is to introduce a construct of political economy as a means of focusing on contemporary issues facing public administrators. Both the concepts and applications of political-economic analysis will be presented to provide the student with a new analytical tool for evaluating public policy, implementation, and impacts on the citizenry. *M.P.A. elective.*

22.920 Contemporary Political Theory

The main currents of political thought in the latter half of the nineteenth and the twentieth centuries with special emphasis on the relations between political theory, philosophy, and political science.

22.922 The Measurement of Political Events

The purpose of this course is to acquaint political science majors with some analytical and mathematical tools appropriate for use in studying politics.

22.923 Politics and Administration in Cities and Towns

An examination of the political and administrative structures which influence the conduct of city and town governments. Particular attention is given to the dynamic relationships between these structures and the implications for public policy-making. *M.P.A. elective.*

22.924 Strategy in Politics

An examination of formal theories of political behavior, stressing elements of strategy and their implications. Relationships between political factors, patterns in political processes, bargaining, decision making, and voting will be covered.

22.926 Trends in American Political Thought

Examination of intellectual concepts and movements that have informed and influenced American political life with emphasis upon those relating to the making and execution of public policy. *M.P.A. elective.*

22.928 Organization Theory and Management

An in-depth study of the major organization theories including the scientific basis for organization theory; models and ideal types; decision-making; application of game theory; systems analysis. *M.P.A. core course.*

22.929 Organizational Analysis

A study of the structure and processes of organization essential for problem-solving and for effecting organizational change. Emphasis is placed upon the application of social science theory and administrative principles in administrative problem identification and problem resolution. *M.P.A. elective.*

22.932 State and Local Finance and Budgeting

This course explores the many channels that the state budget must travel before it becomes a viable document. The several ways by which the budget can be affected before and after it is signed into law will be explored in depth. *M.P.A. elective.*

22.938 Municipal Finance

A discussion of the special problems of budgeting and finance in local governments, including budget preparation and presentation, debt management, capital financing and local taxation policy. *M.P.A. elective.*

22.939 Municipal Law

Designed for the non-lawyer, this course will review the law of municipal corporations. Topics will include general powers and duties, charters, ordinances, administrative rules and regulations, officers and employees, tort liability, policy powers, planning and zoning, taxation and borrowing, elections, licenses and permits. *M.P.A. elective.*

22.940 Comparative Urban Government and Administration

This course will analyze decision-making structures and processes in selected urban areas. Topics will include: examination of world organization trends and implications for administration and politics of cities; changing scopes, scale, participants, and organization of urban politics; and selected issues such as urban housing, finance, leadership, planning and goals. *M.P.A. elective.*

22.942 Asia and the Politics of Development

This course relates the theoretical literature on political development to the concrete attempts to develop in Asia. Because of the diversity in levels and types of political development in Asian states, each student is encouraged to concentrate on one state and explore different ideas about political development within the context of that state.

22.943 The Governments and Politics of Latin America

This course investigates contemporary Latin American politics with particular emphasis on militarism, revolution, executive dominance, and social change. It then focuses on three representative nations such as Mexico, Argentina, and Cuba.

22.944 Nationalism

The evolution and role of nationalism in both theory and practice. Representative nationalistic movements and theories are analyzed.

22.945 Development Politics

This course will focus on the process of political development in the Third World. It will deal with both internal and international issues such as leadership patterns, the role of the military and political parties, and underlying economic and social factors.

22.946 The Politics of Revolution and Change

Analysis of the nature of political change with attention to both theory and practice. Topics discussed are revolution, major trends in contemporary politics, and the relationship between political change and technological, scientific, or social change.

22.948 Government and Politics of North Africa and the Middle East

Comparative analysis of the political systems and foreign policies of African states north of the Sahara. Also stressed is the relationship of this area with the Middle East.

22.950 United States-Soviet Relations

The relations between the United States and the Soviet Union from 1917 to the

present. Topics stressed are: the "nonrecognition" period, the breakdown of the World War II "Grand Alliance," and the nature of the present power conflict.

22.951 United States-Far Eastern Relations

American diplomacy in the Far East, with primary concentration on Japan since World War II, China, and Southeast Asia.

22.952 Communist China's Foreign Policy

A study of the Peking government's relations with Afro-Asia, the Soviet orbit, and the West. Attention is given to policy objectives, strategy, tactics, and the method of decision making in both the party and state apparatus.

22.954 Soviet Relations with Eastern Europe

An analysis of Soviet policy in Eastern Europe, especially Russian efforts after World War II to develop communism and maintain a position of pre-eminence in this region.

22.955 Chinese Politics

This course concentrates on the objectives of the Chinese revolution from 1911 to the present. It examines the political theory and institutions which have been established to promote "permanent revolution" and evaluates the "rationality" of Chinese Communist policies in terms of Chinese goals.

22.957 Japanese Politics

Designed for students in both comparative politics and in international relations. It deals with the unique Japanese electoral system, political processes and organizations, political culture and socialization, the role of business in politics, and Japanese foreign policy.

22.958 Decision-Making in U.S. Foreign Policy

Comprehensive analysis of the governmental mechanism and process for decision-making in U.S. Foreign Policy. Case studies in decision-making will be emphasized.

22.959 American Foreign Policy

Examination in depth of selected issues concerning the role of the United States in world affairs since 1945.

22.960 Problems of World Order I

Emphasizes such topics as appraisal of diverse systems of public order, approaches of international law and international organization to the problem of world order, and the problem of world peace enforcement.

22.961 Problems of World Order II

Political problems of world order are stressed. Representative topics are arms control and disarmament, limits of economic growth, global interdependence, overpopulation, and adequate global food distribution.

22.962 Arab-Israeli Dispute

The Arab-Israeli confrontation has its own dynamic and its nature has changed through the decades. This course analyzes its interaction with the internal politics of the Arab states and Israel, Pan-Arab politics, and the role of the great powers in the region.

22.963 Soviet Foreign Policy

A study of Soviet foreign policy since 1964. Among the topics discussed are: detente in relations with the United States; polycentrism in East Europe; involvements and commitments in the Middle East and Africa; the dispute with China.

22.964 The United Nations

Selected topics on the "non-political" work of the United Nations: human rights; economic, social, health and related problems; decolonization and the trusteeship system.

22.965 International Peace-Keeping

A detailed investigation of the origins, history and theory of interventionary peace-keeping, with reference to the documentation of the United Nations. An assessment of this method of maintaining regional stability, and a projection of potential methods of developing the method to broader applicability.

22.966 International Law

Examination of selected topics in International Law not covered in 22.960 and 22.961.

22.967 Regional Organization

A study of international organization at the regional level, concerned with examining the capability of institutions to foster integration of policy and authority, and with the effect of this progress upon broader international cooperation.

22.968 The Atlantic Community

A topical analysis of European-American diplomacy with particular stress upon security and economic matters. Major consideration of the integration of Europe, American responses, and the results of these interactions for world political and economic stability.

22.969 The United States and the United Nations

A study of the pursuit of American foreign policy through the organs of the United Nations, with emphasis on the uses and effects of parliamentary diplomacy. Examination of the reasons for reversal of American attitudes toward the United Nations as the world moves toward multipolarity. Particular stress upon economic matters and the American role in the UN's quest for a New International Economic Order.

22.970 Methods for Public Administration I

A consideration of the theory and process of administrative study including philosophy of science, quantitative and qualitative designs and methods of problem-solving, and drawing causal principles. *M.P.A. core course.*

22.971 Methods for Public Administration II

The application of social science research and computer programming to administrative problems, including techniques for analysis of survey and other data, and practical methods of gathering, analyzing, and presenting such data. *M.P.A. core course.*

22.972 Techniques of Public Budgeting

This course equips the student with practical skills in the formulation, evaluation, and presentation of budget data. Budgetary information (raw data) provided from com-

puter simulations and from state and local governments, will be analyzed by the student and adapted to various types of budget formats. *M.P.A. elective.*

22.973 Politics and Issues in Public Budgeting

The study of public budgeting in the context of the political, financial and economic environment of present-day government. A heavy focus on contemporary issues and events which affect budgetary processes in the public sector will be included. *M.P.A. elective.*

22.974 Women in Public Management

In this course we will analyze the multiple roots of problems experienced by women in public management positions. Solutions for alleviating the problems will be identified. Students will be expected to engage in experiential learning exercises in addition to academic work. *M.P.A. elective.*

22.975 Equal Opportunity in Public Administration

This course is designed to (1) examine barriers to EEO; (2) develop an awareness of issues surrounding the Affirmative Action Program and particularly, some of the historical perspectives of discrimination of minorities and women; and (3) provide techniques for developing a meaningful Equal Opportunities Program for public organizations. *M.P.A. elective.*

22.976 Legal Issues in Public Personnel Administration

This course is a review and discussion of fact situations and evidence which give rise to public employment litigation. The course emphasizes civil rights and Equal Employment Opportunities court actions. Class discussion includes the type of evidence used in litigation and the types of defenses available to public employers. *M.P.A. elective.*

22.977 Labor Relations in Public Administration

This course studies various theoretical models for analyzing labor-relations structures and dynamics as well as their historical development in the United States. Where appropriate, attention will be given to private sector patterns for comparative analysis. Among the topics treated: bargaining unit determinations, management rights and the scope of bargaining, coalition bargaining, impasse-procedure options, contract administration, affirmative action, civil-service traditions, and public sector unions. *M.P.A. elective.*

22.978 Public Relations in Public Administration

In this course the public manager's role in the process of communication with the public is evaluated. Issues of imagery and accountability as well as current topics will be evaluated. *M.P.A. elective.*

22.979 Social Welfare Policy and Administration

The historical, political, social, and economic determinants of the U.S. social welfare system will be examined. Present policies and programs will be analyzed using a dynamic systems model. Practical experience from all levels of government will be included. *M.P.A. elective.*

22.982 Career Development

This course is designed to help students make career choices, identify their own

career stages, and better understand their role as a part of a work organization. Its purpose is to assist students in career planning. *M.P.A. elective.*

22.983 Federal, State and Local Financial Relations

As state supervision of and assistance to local governments in the area of financial administration is becoming increasingly important, this course explores the relationships between the two levels of government in the assessment and collection of taxes, budgeting, debt management and state aid. In addition, the federal role and fiscal intergovernmental relations are evaluated. *M.P.A. elective.*

22.988 Health Policy and Politics

This course provides an analysis of health care policies, procedures, and alternatives.

22.990 Assigned Reading (maximum: 6 q.h.; minimum: 1 q.h.)

Assigned reading under supervision of a faculty member.

22.991 Thesis (6 q.h.)

Thesis supervision by individual members of the department.

22.992 Internship Readings and Analysis

Academic credit directly related to an internship assignment.

22.994 Seminar in Public Organization and Management

Analysis of specified topics and issues in Public Organization and Management. Purpose of the course is to provide flexibility in presenting material of current interest and to allow in-depth research into specified areas where appropriate. Subject matter to be covered will be covered in registration materials. *M.P.A. elective.*

22.995 Seminar in Public Finance and Budgeting

Analysis of specified topics and issues in public finance and budgeting. Purpose of the course is to provide flexibility in presenting material of current interest and to allow in-depth research into specified areas where appropriate. Subject matter to be covered will be published in registration materials. *M.P.A. elective.*

22.996 Seminar in Public Personnel Administration

Analysis of specified topics and issues in public personnel administration. Purpose of the course is to provide flexibility in presenting material of current interest and to allow in-depth research into specified areas where appropriate. Subject matter to be covered will be published in registration materials. *M.P.A. elective.*

22.997 Seminar in Policy Sciences

Analysis of specified topics and issues in the policy sciences. Purpose of the course is to provide flexibility in presenting material of current interest and to allow in-depth research into specified areas. Subject matter to be covered will be published in registration materials. *M.P.A. elective.*

22.998 Seminar in State and Urban Administration

Analysis of specified topics and issues in State and Urban Administration. Purpose of the course is to provide flexibility in presenting material of current interest and to

allow in-depth research into specified areas where appropriate. Subject matter to be covered will be published in registration materials. *M.P.A. elective.*

39.9F4 Economics for Public Administrators

A program prerequisite for students without any economics coursework at the baccalaureate level. This course introduces basic economics concepts essential to other courses in the program.

psychology

Professors

John C. Armington, Ph.D., Brown University
Harlan Lane, Ph.D., Doc. ès Lettres, Harvard University, Chairperson
Helen Mahut, Ph.D., McGill University
Bertram Scharf, Ph.D., Harvard University
Murray Sidman, Ph.D., Columbia University
Michael Terman, Ph.D., Brown University
Harold S. Zamansky, Ph.D., Harvard University

Visiting Professor

Donald A. Cook, Ph.D., Columbia University

Associate Professors

Edward A. Arees, Ph.D., University of Massachusetts
Roger F. Brightbill, Ph.D., Harvard University
Perrin S. Cohen, Ph.D., Columbia University
François Grosjean, Ph.D., University of Paris
Charles Karis, Ph.D., Boston University
Harry A. Mackay, Ph.D., Queen's University
Alexander A. Skavenski, Ph.D., University of Maryland
Lawrence T. Stoddard, Ph.D., Columbia University

Visiting Associate Professor

Leila R. Cohen, Ph.D., Columbia University

Assistant Professors

Robbin Battison, Ph.D., University of California, San Diego
Martin Block, Ph.D., University of Pittsburgh
Karen Geelen, Ph.D., University of Kansas
Stephen Harkins, Ph.D., University of Missouri
Joanne L. Miller, Ph.D., University of Minnesota
Claude Sigel, Ph.D., University of Pennsylvania

Research Associates

Mitchell Brigell, Ph.D., Kansas State University
Jiuan S. Terman, Ph.D., Brown University
Steve Whittaker, Ph.D., University of New Hampshire
Stuart M. Zola, Ph.D., Northeastern University

THE PROGRAM OF GRADUATE STUDIES

Ph.D. Program

The Department of Psychology offers a full-time program of graduate studies and research in experimental psychology leading to the Ph.D. degree. Applicants are considered only for the doctoral program—the M.A. is granted in the course of progress toward the Ph.D. Since the Ph.D.

degree is awarded in experimental psychology, research accomplishment forms an essential and integral part of the program; students may expect to collaborate with faculty in conducting research in one or more of the following areas: learning and behavioral analysis; psychoacoustics and auditory perception; vision and visual perception; neuropsychology and ethology; language and cognition; experimental personality and social psychology.

Desirable experience includes laboratory courses in psychology and allied sciences as well as courses in mathematics. Applications should be filed by March 1, complete with official transcripts, three letters of recommendation, and scores on the Graduate Record Examinations and the Miller Analogies Test.

Research assistantships and teaching assistantships carry a stipend of \$4,550, with remission of tuition. The department aims to support all graduate students requesting financial aid.

The first year of the program is uniform for all students. It includes four seminars in advanced experimental psychology (language and cognition, neuropsychology, learning, sensation and perception), and two courses in quantitative methods. In addition, all students choose a research adviser and take an active part in one of the current research projects. Detailed descriptions of the current research projects are contained in the brochure, "Research in Psychology at Northeastern," available on request.

At the end of the academic year, each student's readiness for the doctoral program is determined on the basis of his or her performance in the four seminars and written examinations in the quantitative methods courses. Equal emphasis is placed on the quality of research during the first year.

After that year, the structure of the doctoral program is very flexible and assumes that the process of learning and scientific discovery must be individualized. A wide variety of advanced seminars and courses is offered. Colloquia and in-house seminars bring students and faculty together to discuss ongoing research, often with visiting scholars from other institutions. Most important, students pursue their research projects under the expert guidance of their advisers. The advisers and projects available to students vary from year to year. Potential applicants are encouraged to visit the department in order to discuss their interests with the faculty and to observe the program and facilities first-hand.

M.A. in Applied Behavior Analysis

The Department of Psychology also offers a full-time graduate program leading to a terminal M.A. degree in applied behavior analysis. The program is jointly sponsored by Northeastern University and by the University Affiliated Facility of the Eunice Kennedy Shriver Center for Research in Mental Retardation located at the Walter E. Fernald State School for the Retarded.

The two-year program provides the opportunity for students to prepare primarily for service-oriented clinical employment at professional and

supervisory levels, in positions that relate to remedial treatment and programming for the retarded. Experience in clinical settings and in applied and laboratory research, along with the broad academic curriculum, provides preparation also for further graduate studies in human behavior and learning.

Desirable background includes academic and laboratory courses on human and animal learning, preferably with an operant conditioning perspective, and some experience with retarded individuals. Applications should be filed by March 1, complete with transcripts, three letters of recommendation, and scores on the Graduate Record Examinations.

Support for M.A. students can include full tuition remission in return for performing teaching assistant functions for the department. Also, field-placements, where available, allow paid employment for a maximum of 20 hours per week; for incoming students, the current salary range is approximately \$3,700 to \$4,500.

The program is conducted primarily at the Shriver Center and associated facilities. The curriculum stresses the analysis of stimulus control and programmed teaching as solutions to the problems in learning and behavior management encountered by the retarded. In addition, courses encompass the broader interdisciplinary aspects of mental retardation, covering such topics as its biological bases, neurological and sensory impairments, multidisciplinary evaluation and treatment, and administration of services. Experimental design and research seminars prepare the students to conduct a number of applied projects and master's thesis research.

Supervised clinical experience is provided with different retarded populations and age groups, including those with motor and sensory handicaps, in a variety of settings. The training during the first year stresses direct involvement with retarded individuals; in their second year, students may move into positions with supervisory and administrative responsibilities. Additional experiences include: interdisciplinary team evaluations, using behavioral and traditional assessment methods; staff training in behavior management and training techniques; community experience, via out-patient and home-treatment services, consultations to schools and clinics, and parent training; and laboratory research participation.

Most of the faculty have joint appointments in the Psychology Department of Northeastern University and in the Behavioral Sciences Department of the Shriver Center. The faculty and advisers are drawn primarily from the departmental areas of learning and personality (Geelen, Mackay, Rosenberger, Sidman, Stoddard, Zamansky) and from the staff of the Shriver Center. The M.A. students maintain an active involvement with the University and the parent psychology department through their teaching assistant functions, a number of required and elective courses, colloquia, in-house seminars, and informal exchanges with faculty and students.

Potential applicants may write for further information to the department; they are also encouraged to visit the Shriver Center and the department to discuss their interests with the faculty and to see the program and facilities first-hand.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

19.817, 19.818, 19.819 General Experimental Psychology I, II, III (4 q.h.)

The Departmental Proseminar. Faculty lectures, student presentations, and discussions of the experimental literature in the following areas: learning and behavioral analysis; sensation and perception; neuropsychology; language and cognition.

19.808, 19.809, 19.810 Quantitative Methods I, II, III

A survey of the quantitative methods used in experimental psychology, emphasizing applications of computer programming, theory of functions and relations, curve fitting, probability functions, set theory, and analysis of variance.

19.804 Experimental Design in Applied Research (M.A.B.A. course)

Detailed study of experimental methods, emphasizing critical analysis of published research reports and the implementation of the methods in service settings. Students learn and evaluate observational measurement and data-collection techniques. A feasible experimental design, with graphed actual or hypothetical data, must be written in the form of a scientific report.

19.954 Administration of Mental Retardation Services (M.A.B.A. course)

A comprehensive overview is presented of general and specialized services for retarded individuals from organizational and administrative points of view. Issues in planning and initiating new programs, service delivery, staffing, and economics are covered. Visits to varied types of facilities focus on administrative concerns.

19.955, 19.956, 19.957 Systematic Inquiry in Applied Research I, II, III (M.A.B.A. practica)

Each student collects a comprehensive bibliography on a significant topic in applied behavior research and completes a thorough review via written and oral presentations. Emphasis is placed on the integration and analysis of experimental findings and theoretical foundations of the research area, the critical evaluation of current research, and the definition of potentially fruitful future work.

LEARNING AND BEHAVIORAL ANALYSIS

19.809 Applied Behavior Modification (M.A.B.A. course)

In a field setting, students gain experience in applying basic learning principles in remedying behavioral deficits and problem behavior in retarded and emotionally disturbed individuals. Experiences include supervised participation in determining and implementing treatment procedures, data collection and analysis, and assisting in the development of instructional programs to teach attending behavior, concept formation, language and its prerequisites, appropriate play skills, and gross motor skills.

19.811 Programmed Learning (M.A.B.A. course)

Students review the history and theoretical and experimental bases of programmed instruction and errorless learning. Emphasis is placed on the detailed analysis of stimulus control—its measurement, and ways to produce it.

19.812, 19.813, 19.814 Programming Practicum I, II, III (M.A.B.A. courses)

Students design, test, and evaluate instructional programs for teaching specific subject matter, for remedial application to behavior problems, and to test instructional theory. Supervision is provided by a weekly programming research and data seminar, in collaboration with the student's adviser.

19.820 Mental Retardation Seminar (M.A.B.A. course)

Interdisciplinary seminar taught by faculty from the several Boston-area universities associated with the University Affiliated Facility. The role of each discipline in the care and treatment of retarded people is defined and coordinated with the functions of other relevant disciplines. Specialties include: communication disorders (Emerson College), dentistry (Tufts University), medical disciplines (e.g., pediatrics, neurology, orthopedics, genetics—Massachusetts General Hospital, Harvard Medical School), nursing (Boston University), nutrition (Framingham Teacher's College), occupational therapy and physical therapy (Sargent College of Boston University), social work (Boston University and Simmons College), sociology (Brandeis University), special education (Boston University), and psychology (Northeastern University).

19.821 Behavior Change in Institutions (M.A.B.A. course)

A review of successful projects which have been carried out to provide effective remediation and rehabilitation in institutions for the mentally ill, the mentally retarded, the juvenile delinquent, and the developing human (schools).

19.835, 19.836, 19.837 Advanced Learning Seminars I, II, III

These seminars cover contemporary research in operant conditioning, with emphasis on relating the techniques of behavioral analysis to problems of reinforcement, comparative psychophysics, and physiological psychology.

SENSATION AND PERCEPTION

19.828 Contemporary Psychophysics

A mathematical study of signal detection theory; human and animal psychophysical methods; theory of the ideal observer.

19.830 Psychoacoustics

This seminar deals with the relationship between sound and auditory perception. After five tutorial sessions on the physics and laboratory generation of sound, thresholds, masking, loudness, pitch, and sound localization, students will lead discussions based on research papers in the psychoacoustic literature.

19.833 Perception

A detailed consideration of research in such areas as form, space, and pattern perception, recognition, and the effects of set and motivation on perception. Physiological concomitants of perceptual phenomena will be considered.

19.840, 19.841, 19.842 Vision I, II, III

Seminars: classical and modern problems in vision. Recent journal articles will provide primary source materials for discussion. Consideration will be given to problems of stimulus specification, retinal structure, photochemistry, and psychophysical measures of sensitivity, color vision, and electrophysiology.

NEUROPSYCHOLOGY

19.880, 19.881 Sensory Psychophysiology I, II

Concentration on the anatomy and physiology of the various sensory systems, and correlation of these data with psychophysical and perceptual concepts. Laboratory work will be included.

19.844, 19.845, 19.846 Physiological and Comparative Psychology I, II, III

Seminars: a shared background, key concepts, and central issues of the field of physiological and comparative psychology.

19.915 Biological Bases of Mental Retardation (M.A.B.A. course)

The course considers the relationship between biological malfunction, of the brain in particular, and the defective learning ability and other behavioral abnormalities which constitute mental retardation. The aim is toward as comprehensive a survey as time permits. Exercises include actual case presentations as illustrative examples.

19.919 Neurochemistry and Behavior

This seminar will examine different experimental approaches to the problems involved in uncovering the relationships between changes in brain activity and changes in behavior produced by drugs. Discussions will center on current theorizing on the role of early experience, environmental factors, biological rhythms, and other facets in the determination of drug-induced behavioral changes.

19.952, 19.953 Neurological and Sensory Impairments Seminars I, II (M.A.B.A. course)

Etiology, assessment, and diagnosis, clinical characteristics, and education of the mentally retarded with visual, hearing, and motor deficits are studied. In addition to discussion participation, experiences are provided in evaluation and remedial programming, via application of operant techniques.

LANGUAGE AND COGNITION

19.870 Psycholinguistics

Seminar. In depth analysis of research methods and findings in selected problems in the psychology of language, including developmental, anthropological, and experimental psycholinguistics.

19.871 Psycholinguistics Laboratory

Students perform modified replications of classical experiments in several areas of psycholinguistics and conduct and report a psycholinguistic study of their own design.

19.951 Child Language Development (M.A.B.A. course)

Learning theory approaches to language acquisition are contrasted with psycholinguistic and neurogenic theories. Works of Skinner and Chomsky are analyzed, and implications for both normal and abnormal language development are discussed.

EXPERIMENTAL PERSONALITY AND SOCIAL PSYCHOLOGY

19.822, 19.823 Psychopathology I, II (4 q.h.)

A detailed consideration of the major forms of psychopathology, including the neuroses (obsessional states, hysteria, anxiety states, phobias), the psychoses (schizophrenia, mania, depression, paranoia), psychosomatics, sociopathy, conduct disorders, organic disorders, and mental retardation.

19.901, 19.902, 19.903 Personality Theory and Research I, II, III

A survey of representative theoretical formulations of the normal personality and its development, and an examination of experimental evidence bearing upon relevant concepts and assumptions (anxiety, repression, aggression, cognitive styles).

SPECIAL TOPICS

19.990 Special Topics in Psychology (maximum: 9 q.h.)

19.991 Thesis (6 q.h.)

Experimental work for the master's degree requirement.

19.995 Dissertation (0 q.h.)

Experimental and theoretical work for Ph.D. candidates.

sociology and anthropology

Professors

Morris Freilich, Ph.D., Columbia University
Blanche Geer, Ph.D., Johns Hopkins University
Elliott Krause, Ph.D., Boston University
Frank Lee, Ph.D., Yale University
Morton Rubin, Ph.D., University of North Carolina
Earl Rubington, Ph.D., Yale University

Associate Professors

Ronald J. McAllister, Ph.D., Duke University, Chairperson
M. Patricia Golden, Ph.D., Cornell University
Lila Leibowitz, Ph.D., Columbia University
Jack Levin, Ph.D., Boston University
Carol Owen, Ph.D., Cornell University

Assistant Professors

Arnold Arluke, Ph.D., New York University
Richard Bourne, Ph.D., Harvard University
Marcia Bystryn, Ph.D., New York University
Paul Dredge, Ph.D., Harvard University
William Greenbaum, Ed.D., Harvard University
Freddie Hill, Ph.D., Northwestern University
Wilfred Holton, Ph.D., Boston University
Debra Kaufman, Ph.D., Cornell University
Thomas Koenig, Ph.D., University of California, Santa Barbara
Marlene Y. MacLeish, Ph.D., Harvard University
John Smetanka, Ph.D., Harvard University

Admission

The general procedures and requirements are set forth on page 14. Students will normally be admitted to begin their graduate work in the fall quarter only. Applications received after March 15 will usually not be considered. Each application will be reviewed on its own merits. Any questions concerning the adequacy of the undergraduate background in sociology or anthropology will be considered individually. In some cases, students may be asked to make up certain deficiencies before proceeding to the basic requirements. Exceptions will be made with respect to procedural or substantive requirements on an individual basis if the circumstances seem sufficiently compelling.

In addition to examining the catalog and course offerings, all prospective candidates are urged to learn something about the scholarly interests and writings of our faculty and to talk with graduate students now in residence

to ascertain whether or not we have something to offer in terms of their capabilities, needs, and interests.

NB. Some of the requirements listed below for both the M.A. and Ph.D. will undoubtedly have been modified. Please check with the department and/or the graduate school for the most recent information. This applies also to course offerings.

THE MASTER'S DEGREE

The department offers graduate programs that lead to a Master of Arts degree in sociology, or a Master of Arts degree with concentration in social anthropology. Forty-two quarter hours of B or better academic work are required for the degree. Certain advanced undergraduate courses offered by the department may be taken for graduate credit with the approval of the department. In these, students must maintain a better than B average.

In general, students are encouraged to fashion a program of studies best suited to their needs and capabilities instead of following any single set of rigid requirements. To this end, all entering students should consult with the faculty adviser assigned to them, and other faculty members if possible, before registering for courses.

For the Master of Arts in Sociology, students are generally required to take two quarter courses in theory (usually 21.805 and 21.806) and two in methodology (usually 21.810 and either 21.811 or 21.916). The statistics requirement may be satisfied by achieving at least a B in 21.813 or its equivalent. All students are strongly advised to take some work in social anthropology.

For the Master of Arts in Sociology, with concentration in Social Anthropology, students are generally required to take two quarter courses in theory (usually 21.805 and 20.802) and in methodology, in addition to a basic course in anthropology (usually 20.808). Other requirements will be individually determined. All students are strongly advised to take some work in sociology.

Students who can demonstrate proficiency in any of the requirements need not take those particular courses, and should petition the graduate committee for an opportunity to demonstrate proficiency.

A master's paper is required and earns four quarter hours of credit. This paper may be based on empirical or library research, and must be of publishable quality. It is expected that the full-time student will complete the master's paper no later than the end of the second year. Students planning to go on for the Ph.D. are urged to take the qualifying examination during their second year of residence as the results will be a major determining factor in deciding whether to encourage the student to try to go on or not.

Deadlines for Submission of Master's Paper

A student must have substantially finished the master's paper as certified by the first reader on or before April 1 of the year in which the student ex-

pects to be awarded the degree. Those who miss the April 1st deadline will normally have to wait until the subsequent fall quarter, and should not expect that a defense can be set up much before November 1st of that quarter.

THE DOCTOR OF PHILOSOPHY DEGREE

The department offers the Ph.D. in sociology. A limited number of students will be enrolled in the Ph.D. program so as to provide highly personalized study and research training with individual supervision.

Admission

Applicants to the doctoral program should apply for admission not later than March fifteenth of the year in which they expect to complete the requirements for the master's degree.

Students seeking admission whose master's degree is not in sociology will be considered on an individual basis. A tentative evaluation of the probability of advanced standing will be made at the time the student is admitted with the final determination after the qualifying examination has been completed.

Students completing their master's at Northeastern will be considered for admission to the doctoral program only after the results of their qualifying examination have been evaluated. Students completing their master's at another institution are admitted with the expectation that they will take the qualifying examination at the first available opportunity.

Residence Requirement

The University's residence requirement can be satisfied by one year of full-time graduate work, or its equivalent, beyond the Master of Arts degree. If the M.A. has not been in sociology, a longer period of residence will undoubtedly be essential. Most students should expect to spend approximately two years or the equivalent in full-time graduate study beyond the requirements of the master's degree.

Degree Candidacy

Degree candidacy is established in accordance with the general regulations of the graduate school.

Qualifying Examination

Students will be examined on their ability to interpret readings and experience sociologically. A written examination is followed by an oral hearing where a) the strengths and weaknesses shown by the examination are discussed with the student and suggestions are made for remedying the weaknesses and b) in the light of these results a future course is charted for the student. The main purpose of this examination is diagnostic and should

help both the department and the student to determine the best course of future action. Excessive weaknesses will lead to a recommendation to consider pursuing alternatives elsewhere.

Course Requirements

Generally, thirty-three hours of academic work beyond the master's degree are required. However, the actual number needed by any particular student will be specially determined in each case. Depending on background, experience, and performance, a greater or lesser number of formal courses may be required. Decisions on special cases will be made by the Committee on Graduate Studies (COGS), acting in conjunction with the student, the student's adviser, and the chairperson of the department. Students entering from another university may be required to take certain basic courses before proceeding with the doctoral program.

Language Requirements

A reading knowledge of one language in which there is substantial sociological literature is required. Students must submit their choice to the COGS for approval. The language requirement should be satisfied before admission to the comprehensive examination. Statistics and/or advanced mathematics as well as languages needed primarily for field research are considered an integral part of the training of students specializing in such directions, and are therefore not the equivalent of the general language requirement. However, with the approval of COGS a computer language may be substituted.

Comprehensive Examination

During the period of doctoral degree candidacy, each student must pass a comprehensive examination, the purpose of which is to ensure that the student has breadth in sociology in areas other than that pursued in the dissertation. Two "state of the art" papers are required in fields which are not close to that represented by the dissertation. When a student feels ready to undertake these papers, s/he must submit the choice of fields to the COGS for approval.

A student who wants to demonstrate breadth in sociology in another way must petition the COGS. The comprehensive examination must be passed at least nine months before the commencement at which the Ph.D. is to be awarded.

Doctoral Dissertation

The student must submit a prospectus describing the topic of the doctoral dissertation, the methods of research, and the theoretical relevance of the problem. This prospectus is to be discussed with and approved by the dissertation committee consisting of the major adviser, two readers within

the department and at least one reader from outside the department. The revised prospectus is then filed with the department.

Deadlines for Considering a Doctoral Dissertation

The chairperson of the dissertation committee should be fully satisfied that a dissertation is substantially complete on or before April 1 of the year in which the candidate expects to defend.

Final Oral Examination

The dissertation will be defended after completion of all other requirements for the doctoral degree. This oral defense will be held approximately four weeks after the dissertation has been accepted by the dissertation committee, and at least two weeks before the commencement at which the degree is to be awarded.

NB. Some of the requirements listed above for both the M.A. and Ph.D. will undoubtedly have been modified. Please check with the department and/or the graduate school for the most recent information. This applies also to course offerings.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

SOCIAL ANTHROPOLOGY

Many undergraduate courses in the 20.200 series may be offered for graduate credit. Students should check the current course announcements to take advantage of these offerings.

20.802 Theory (4 q.h.)

History of major contemporary orientations: evolutionary approaches, culture area, cultural ecology, functionalism, structuralism, and analysis of current status of these and related theories.

20.808 Human Origins (4 q.h.)

An examination of the data on fossil remains and on contemporary primates which are essential for understanding human physical and behavioral evolution.

20.815 Tribal Societies and Culture

The structures and institutions of bands, tribes, and chiefdoms: comparative and functional studies of tribal societies and the dynamics of change under contact situations.

20.820 Peasant Society and Culture

Institutions of peasant society. The structure of traditional civilizations and the interrelations between urban and local communities: comparative and functional analysis of the peasant community and the dynamics of change from peasant to post-peasant and industrialized societies.

20.825 Language and Communication

Human communication, including language. Theories of the evolution of language and the application of models derived from the study of language to other aspects of behavior.

20.828 Aggression

Concepts of aggression as they have been used in evolutionary and comparative anthropological formulations. Professional and popular publications in anthropology, ethology, and psychology are analyzed.

20.830 Individual and Culture

Examination of current theory and method in the study of the interplay between personality and culture. Contributions by various disciplines are discussed.

20.835 Kinship and Social Structure

A variety of kinship systems and their terminological and structural components and the way in which their systems articulate with other social institutions.

20.836 Family in Evolutionary Perspective

The emergence of family from pre-human patterns, its biological and behavioral components, and its cross-cultural variations examined from an evolutionary perspective.

20.840 Urban Anthropology

Selected problems in anthropological studies in urban societies.

20.850 Religion and Myth

Nature and institutionalization of primitive, ancient, and contemporary religions. Exploration of religious concepts and movements in relation to social, religious, and political organization.

20.860 Cultural Ecology

Examines mankind's adaptation to environment and the effect of different human adaptations on natural systems.

20.870 Evolution of Society

The development of political and economic institutions: specialization, social stratification and the emergence of civilization.

20.880, 20.881, 20.882, 20.883, 20.884, 20.885

Ethnographic area courses (India, Africa, Mediterranean and others) will be offered as resources permit.

20.950, 20.951, 20.952 Directed Study in Social Anthropology (maximum: 9 q.h.)

Reading and empirical research in social and cultural anthropology supervised by members of the anthropological staff.

20.980 Contemporary Issues in Social Anthropology

Contemporary issues in the field of anthropology. Supervised readings and written reports on special problems.

20.990 Seminar (maximum: 9 q.h.)

Discussion of selected topics in the field of anthropology.

20.991 Master's Paper in Sociology with an Emphasis in Social Anthropology

(4 q.h.)

Empirical or library research meeting the criteria for publication in a professional journal. *Supervision by members of the department.*

SOCIOLOGY

Many undergraduate courses in the 21.200 series may be offered for graduate credit. Students should check the current course announcements to take advantage of these offerings.

21.805, 21.806 Foundations of Social Theory I and II (4 q.h. each quarter)

The classic theorists (Durkheim, Weber, Marx, Simmel, and others) will be considered intensively.

21.807 Contemporary Sociological Theories

Analytic treatment of major contemporary theories such as functionalism, conflict, neo-Marxism, and others. *Prep. 21.806.*

21.808 Recent Developments in Sociological Theory

New horizons in theory and the relation of theory to research. Topics to be selected each year and announced by the instructor.

21.810 Introduction to Research Methods I (4 q.h.)

A survey of methods of social research including field study and participant observation techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experimental design, content analysis and use of available data.

21.811 Introduction to Research Methods II (4 q.h.)

Quantitative techniques of analysis. Students will conduct individual research projects.

21.812 Current Issues in Social Research

Selected topics in methods of social research will be examined.

21.813 Statistical Methods for Sociologists (4 q.h.)

This course is a detailed introduction to statistical methods most relevant to sociology. Topics include tabular analysis, non-parametric statistics, analysis of variance, regression analysis, path analysis, measures of association, estimation and univariate and multivariate hypothesis testing. The approach will presume a knowledge of elementary statistical theory.

21.814 Mathematical Models and Advanced Statistical Methods for Sociologists

This course will include selected topics in advanced sociological statistics: introduction to Markov chains, factor analysis, multiple classification analysis, and model building. The orientation will be toward the more advanced students and the approach will be somewhat mathematical. Some mathematical aptitude or at least one

previous college course in mathematics is suggested. Graduate statistics (21.813) is a prerequisite.

21.817 American Society

Study of the development of and the changes in the institutional structure of American society in comparison with certain other social systems.

21.820 Sociology of Deviant Behavior

Applications of sociological concepts and principles to some problems of social disorganization in industrial societies. Analysis of such problems as suicide, prostitution, physical handicaps, unemployment, alcoholism, sexual deviance, and gambling. *Prep. 21.806.*

21.822 Sociology of Poverty

An analysis of sociological perspectives on causes of poverty, public views on poverty and institutional responses to poverty. A concern with policy issues and implementation of policies is emphasized. For advanced students in the social sciences and in the various human service schools of the university.

21.824 Sociology of Alcoholism

The course is concerned with examining four general problem areas: the conditions under which people categorize others as alcoholics; the processes by which persons so defined are assigned deviant status and assume appropriate roles and self-images as alcoholics; the development of drinking careers and their relationship to deviant subcultures; and the social situations in which people transform their deviant identities as alcoholics. The course applies organizational analysis to the development and changing network of alcoholism treatment services and tries to develop some tentative generalizations on the social organization of alcoholism.

21.827 Sociology of Delinquency

Social and psychological factors of delinquency and their implications for prevention, rehabilitation, and treatment.

21.832 Sociology of Crime and Justice

A sociological and legal analysis of the criminal justice system, concentrating on police and law enforcement; plea-bargaining; courtroom research and trial strategies; sentencing; and prisoners' right and corrections. The relationship between race, social class and crime is also considered, as are the sociological explanations of crime causation.

21.835 Theories of Criminology

Theories and philosophies, underlying various correctional systems. Schools of thought in criminology and penology. Theoretical approaches to the crime and delinquency problem from the beginnings of criminology to current thinking.

21.837 Sociology of Law

Fundamentals of law. The concept of social control. Order and Law. Consensus and conflict. Analysis of the normative-formative influences of law. Mores and morals. The concept of justice. Analysis of some legal institutions.

21.840 Sociology of Medicine

Social aspects of illness and medicine, historically and cross-culturally. Illness and the medical profession in modern society and their structural settings: the community, the hospital, the medical school. Research studies in the field will be examined critically and problems for future research will be specified.

21.843 Sociology of Education

The structure and functioning of educational institutions. Student, faculty, and administrative perspectives. Emphasis will be placed on the role of education in processes of socialization, social mobility, social change, and social control.

21.847 Formal Organizations: Administration and Structure

Analysis of the goals and functions in modern organizations. Aspects of bureaucratization will be examined within business firms, public institutions, and private associations.

21.850 Sociology of Occupations and Professions

The relations between the occupations and professions and society. Special topics may include occupational stratification, professional group behavior, recruitment and socialization of occupations and professions, and political activism.

21.851 Sociology of Work

The course is designed to examine the effects which the social organization of work has on the lives of workers as well as on the structure of society.

21.855 Political Sociology

Sociological analysis of power relations and power systems with special attention to the bases of political power, processes of change in power, and the part played by violence and revolutionary movements.

21.857 Economic Sociology

The role of economic factors in the social process. Consideration will be given to both classic economic theory and its impact on classic social theory, and the potential interrelations between modern economic theory (especially model-building approaches) and general sociological problems.

21.860 Intergroup Relations

The relations between various racial, nationality, cultural, and religious groups with emphasis on historical development. Particular attention will be paid to American society with its specific problems of adjustment and assimilation.

21.861 Sociology of Prejudice and Discrimination

A study of the characteristics, causes, and consequences of prejudice and discrimination, with particular reference to American society.

21.863 Sociology of Religion

A sociological analysis of religious institutions and experiences in their historical and contemporary content. Religion and political content will be considered.

21.865 Sociology of Knowledge

The relationship between the social base of a society and its intellectual products. The viewpoints of authors such as Marx, Weber, Mannheim, G. H. Mead, the Neo-

Marxian, and other modern schools will be considered. *Prep. Three terms of graduate theory.*

21.870 The Family

Social structure and social functions of the family as a social institution. Relations between the family and other institutions in society will be examined comparatively and historically.

21.873, 21.874 Childhood and Adolescence I, II

Growth and development of the child in the social context. Primary socialization in the family including the transmission of role expectations, values, and the development of self concept. Secondary group socialization in school, neighborhood, and peer group.

21.877 Theories of Socialization

A critical examination of the major theories in the field. Attention will be focused on the work of Freud, Piaget, Cooley, Mead, Parsons, and Merton.

21.880 Community Analysis

Ecological theories of man's relation to his physical environment. Development of the concept, and discussion of methods for community study. Comparison between rural communities and urban neighborhoods. Discussion and evaluation of community action programs.

21.881 Community Research Lab.

21.885 Urban Sociology

Theories of the development of urban life. Comparisons between pre-industrial and industrializing urban areas. Methods for the study of urban social structure and change. Evaluation of contemporary metropolitan action programs.

21.886 Seminar in Urban Social Policies

Social science theories and methods are evaluated from the perspectives of urban affairs. *Consent of instructor.*

21.887 Sociology of Policy, Planning and Evaluation

A general introduction to the social, political and economic factors affecting policy formation and the eventual success or failure of social programs in health, education, welfare, and urban planning. Stress on evaluation of policy alternatives, and planning problems. For advanced students in the social sciences and in the various human service schools of the university.

21.888 Metropolitan and Regional Issues

Comparative analysis of problems, policies, programs, and activities associated with metropolitan and regional life. Includes assessment of values, institutions, networks, interest groups, decision-making, service delivery, growth and development, environment, equity, and integration. Case studies in societal context.

21.889 Boston Seminar

A case study in urban development, including the evaluation of environmental and historical circumstances, demands for services, response to events, programs. Basis

for value systems of Yankees, ethnics, and cosmopolitans. Impact on downtown and neighborhood relations. Metropolitan prospects.

21.890 Middle East Area Study

Socio-cultural analysis of the Middle East. Ecological, structural, institutional, and normative factors in nomadic, rural, and urban life. Comparative regional analysis.

21.895 Latin American Societies

Study and analysis of selected Latin American societies with particular attention to such countries as Cuba, Mexico, Peru, and Brazil. Emphasis on urbanization and industrialization, social and political change.

21.900 Issues in Social Psychology

Human behavior and theories of self from a sociological and psychological perspective. Special consideration of interpersonal relations, socialization, and symbolic interaction.

21.910 The Sociology of Science

Selected topics dealing with interactions between science and society. *Consent of instructor.*

21.912, 21.913 Experimental Methods in Social Research I, II

This course covers experimental design and laboratory methods in sociology. The small groups laboratory is treated as a setting for testing sociological theory. The emphasis is upon techniques and problems in the creation and manipulation of social variables in the laboratory situation, although the techniques of the natural experiment are also considered.

21.914 Rhetoric in Sociology

Critical examination of the conventional forms of sociological writings. How conventions differ by theoretical perspective and paradigm.

21.915 Seminar in Symbolic Interaction

The social psychology of groups as found in the works of Mead, Becker, Blumer, Goffman, and others.

21.916, 21.917 Seminar in Qualitative Analysis I, II (4 q.h. each quarter)

Qualitative techniques of analysis. Social structure process and meaning in interacting groups. Each student studies a face-to-face group by means of participant observation using symbolic interaction concepts.

21.920 Social Stratification

Theories of inequality between groups in historical perspective, from classical to modern industrial times. Discussion and evaluation of sociological research in social stratification in regard to different social and cultural groups.

21.930, 20.930 Social and Cultural Change S, A

Two-quarter course, in conjunction with Anthropology.

Analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.

21.940, 21.941 Social Control I, II

Seminar in research, theories, and methods in the sociology of social control.

21.950, 21.951 Seminar in Social Structure I, II

Seminar relating current theories and research in sociology, social psychology, and social anthropology.

21.960, 21.961, 21.962 Seminar on Socialization I, II, III

I. Instructor reviews theories and findings in organizational socialization. II. Students design studies in organizational socialization. III. Students present results of their studies. *Not open to first year students.*

21.970, 21.971, 21.972 Pro Seminar in Sociology and Anthropology (1 credit each quarter)

This course is required of all graduate students and is designed to socialize them for participation as professional sociologists and anthropologists. Topics discussed will be the nature of intellectualism and the functions of an intellectual in society today, the university as a structure and as a community of scholars, the nature of professional organizations, teaching sociology and anthropology, the organization of sociological and anthropological research, ethics in the profession, the nature of applied sociological and anthropological work. The course will allow practical experience in self-presentation and giving colloquia.

21.980, 21.981, 21.982, 21.983 Contemporary Issues in Sociology

Contemporary issues in sociology. Supervised readings and written reports on special problems.

21.990 Seminar (maximum: 9 q.h.)

Discussion of selected topics in the field of sociology.

21.991 Master's Paper in Sociology (4 q.h.)

Supervision by members of the department. Empirical or library research meeting the criteria for publication in a professional journal.

21.992, 21.993, 21.994 Directed Study in Sociology (Maximum: 9 q.h.)

Reading and research under the direction of a faculty member. *Open to doctoral candidates with the consent of the graduate committee.*

21.995 Doctoral Dissertation

21.975 Tutorials in Teaching (3 credits maximum)

The purpose of this tutorial is to discuss issues and problems in teaching. It is a required course for all doctoral students and should be taken during a quarter when a doctoral candidate has major responsibility for designing and executing a course in either sociology or anthropology.

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*Paul M. Lepley

Richard Lindhe

Morton Loewenthal

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*Melvin Mark

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J. Edward Neighbor

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*Paul M. Pratt

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* Appointed by the President

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Janice Walker, A.B., *Assistant Director of the Graduate School of Education*

University Graduate Council

The Council determines broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the Council.

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Joseph Zelinski, *Vice Chairman*
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 Carl S. Christensen
 Lal C. Chugh
 Robert D. Croatti
 John W. Fox
 Robert E. Gilbert
 Bernard M. Goodwin
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 Arlene T. Greenstein
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1978-1980**

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Harlan Lane, *Professor of Psychology and Chairperson of the Department*

Ronald McAllister, *Associate Professor of Sociology and Chairperson of the Department*

Raymond H. Robinson, *Professor of History and Chairperson of the Department*

David E. Schmitt, *Professor of Political Science and Acting Chairperson of the Department*

Stanley J. Trachtenberg, *Professor of English*

Roy Weinstein, *Professor of Physics and Chairperson of the Department*

Karl Weiss, *Professor of Chemistry and Chairperson of the Department*

Henry O. Werntz, *Associate Professor of Biology and Chairperson of the Department*

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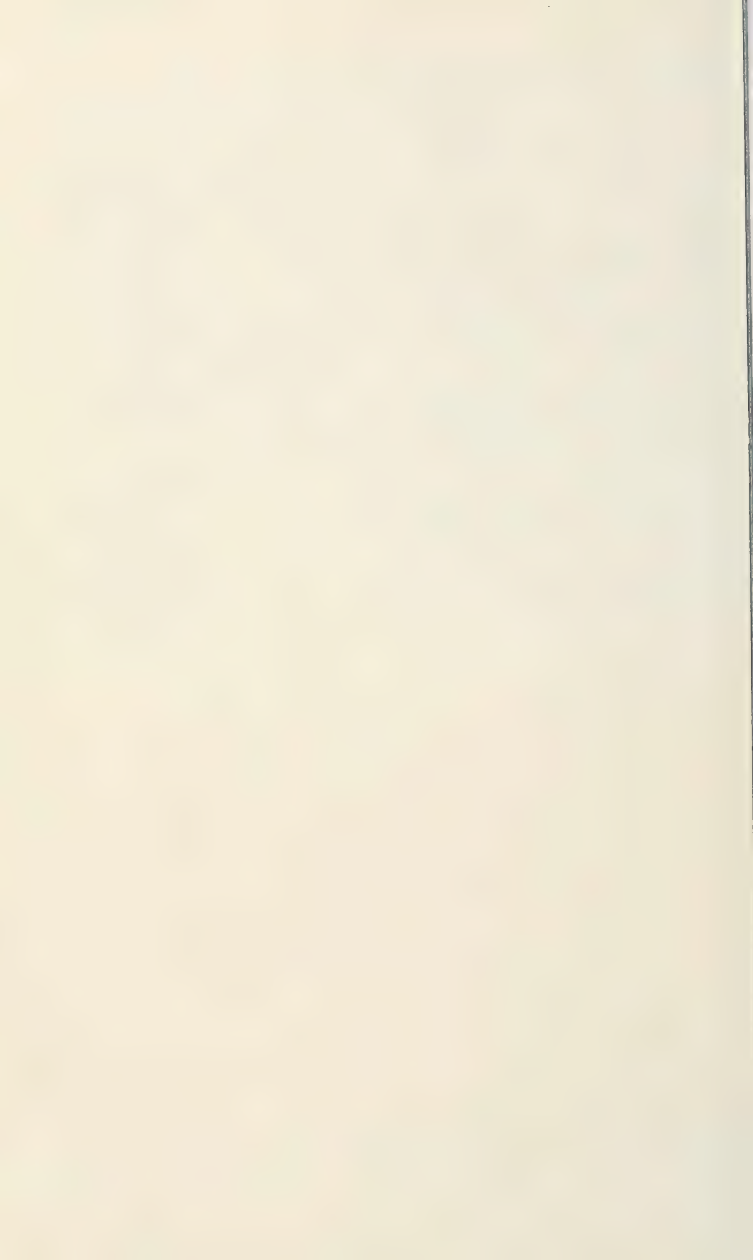
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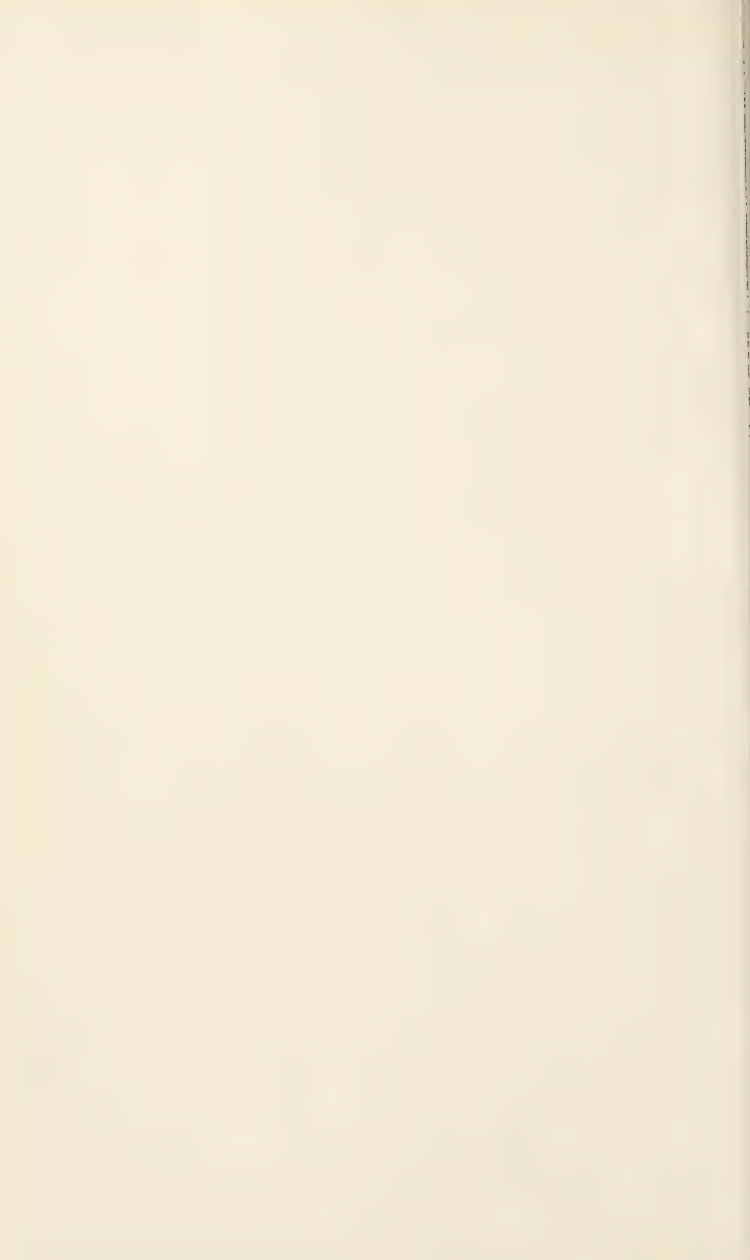
Northeastern University Bulletin

University College
1978-79

Part-time Programs



August Issue



August Issue

Northeastern University Bulletin

University College 1978-79

Part-time Programs



NEW ENGLAND
ASSOCIATION
OF SCHOOLS
AND COLLEGES
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Part-time day and evening
undergraduate programs in:
business administration
health professions
law enforcement
liberal arts
education
therapeutic recreation services

Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115
(617) 437-2400

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The Northeastern University catalog contains *current information* regarding the University calendar, admissions, degree requirements, fees, and regulations, and such information is not intended to be and should not be relied upon as a statement of the University's contractual undertakings.

Northeastern University reserves the right in its sole judgment to promulgate and change rules and regulations and to make changes of any nature in its program, calendar, admissions policies, procedures and standards, degree requirements, fees, and academic schedule whenever it is deemed necessary or desirable, including, without limitation, changes in course content, the rescheduling of classes, cancelling of scheduled classes and other academic activities and requiring or affording alternatives for scheduled classes or other academic activities, in any such case giving such notice as is reasonably practicable under the circumstances.

We at Northeastern will do our best to make available to you the finest education we can provide, the most stimulating atmosphere in which to learn, and the most congenial conditions under which you may enjoy the learning experience. But the quality and the rate of progress of your academic career is in large measure dependent upon your own abilities, commitment, and effort. You will be a full participant in an educational partnership. We will and, indeed, can only make the opportunities available to you; it is up to you to take advantage of them.

This is equally true with your career upon graduation. We cannot guarantee that you will obtain any particular job; that will depend upon your own skills, achievement, presentation, and other factors such as market conditions at that time. Similarly, in many professions and occupations there are increasing requirements imposed by federal and state statutes and regulatory agencies for certification or entry into a particular field. These may change during the period of time when you are at Northeastern and they may vary from state to state. While we will be ready to help you find out about these requirements and changes, it is your responsibility to initiate the inquiry because we cannot know what your expectations and understandings are unless you tell us.

In brief, what we are saying to you is that we are here to offer you educational opportunities and choices and to assist you in finding the direction in which you want to steer your educational experience. But you are a partner in this venture with an obligation and responsibility to yourself.

The University College Bulletin is a document of record issued in August, 1978.

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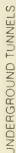
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SCALE 0 100 200
STREET DIRECTION Δ
PARKING \blacktriangleright



Map Code	Academic and Service Buildings	Bldg. Code
13	African-American Institute	AF
G6	Barletta Natatorium	BN
F10	Boston YMCA	BY
G10	Botolph Building	BT
G6	Cabot Physical Education Center	CB
C6	Cahners Hall	CA
H6	Churchill Hall	CH
B6	Cushing Hall	CU
I5	Dana Research Center	DA
G5	Dockess Hall	DK
G9	Dodge Library	DG
G8	Elli Student Center (Auditorium section)	EL
H8	Ell Student Center (Student Lounge section)	SC
H6	Forsyth Building	FR
H5	Forsyth Building Annex	FA
G4	Greenleaf Building	GR
G7	Hayden Hall	HA
G1	Hillel House	HL
H11	Hurling Hall	HT
B6	Kerr Hall (Faculty Center)	KH
F5	Knowles Center (Gryzmish Hall)	KG
F5	Knowles Center (Volpe Hall)	KV
J3	11 Leon Street	UO
J3	15 Leon Street	UN
MU	Mugar Life Sciences Building (Peabody Health Professions Center)	MU
G9	Parker Building	PA
G3	Peabody Center	PC
G9	Richards Hall	RI
F7	Robinson Hall	RH
H10	Robinson Hall	RB
F4	Stearns Center	ST
H5	United Realty Building	UR
F10	Boston YMCA	BY
A8	115 Hemenway Street	IS
A8	119 Hemenway Street	HS
B7	153 Hemenway Street	S3
B6	157 Hemenway Street	S7
C6	163 Hemenway Street	S6
B6	Kerr Hall	KB
D10	Light Hall	LH
F1	Melvin Hall	MH
B7	Rubenstein Hall	RH
E8	106-122 St. Stephen Street	SS
B8	Smith Hall	SH
E7	Spaulding Hall	SP
C7	Stetson Hall East	SE
D7	Stetson Hall West	SW
E5	White Hall	WH

UNIVERSITY COLLEGE OFFICES

Office for General Information	102 Churchill Hall	437-2400
Office of the Registrar	120 Hayden Hall	437-2300
Burlington Campus		272-5500

Regular Office Hours

Boston		
120 Hayden Hall	Monday-Friday	8:30 a.m.-8:30 p.m.
102 Churchill Hall	Monday-Friday	8:30 a.m.-8:30 p.m.
	Saturday	8:30 a.m.-1:00 p.m.
Burlington (Suburban Campus)	Monday-Friday	8:00 a.m.-10:00 p.m.
	Saturday	8:00 a.m.-1:00 p.m.
Framingham North High School	Monday-Thursday	5:30-10:00 p.m.
Brockton (Cardinal Spellman High School)	Wednesday-Thursday	5:30-10:00 p.m.
Norwood Junior High North	Monday-Wednesday	5:30-10:00 p.m.
Weymouth High Schools	Monday-Thursday	5:30-10:00 p.m.
Reading (Austin Prep.)	Tuesday	5:30-10:00 p.m.
Milford High School	Tuesday	5:30-10:00 p.m.
Revere High School	Tuesday & Thursday	5:30-10:00 p.m.
Marshfield	Tuesday & Thursday	5:30-10:00 p.m.

Summer Office Hours

Boston		
102 Churchill Hall	Monday-Thursday	8:30 a.m.-8:30 p.m.
	Friday	8:30 a.m.-4:30 p.m.
	Saturday	Closed
120 Hayden Hall	Monday-Thursday	8:30 a.m.-8:30 p.m.
	Friday	8:30 a.m.-4:30 p.m.
Burlington	Monday-Friday	8:00 a.m.-10:00 p.m.
	Saturday	Closed

1978-1979 ACADEMIC CALENDAR

Fall Quarter 1978

Classes Begin Monday, September 25, 1978

FALL REGISTRATION DATES

Boston	5:30 - 8:00 p.m.	Tuesday-Friday September 5-8
Boston	9:00 a.m. - 12 noon	Saturday, September 9
Boston	5:30 - 8:00 p.m.	Monday-Thursday September 11-14
Burlington	5:30 - 8:00 p.m.	Monday-Thursday September 11-14
Burlington	12 noon - 8:00 p.m.	Tuesday, September 12
Brockton (Cardinal Spellman H.S.)	5:30 - 8:00 p.m.	Thursday, September 7 and Wednesday, September 13
Framingham North H.S.	5:30 - 8:00 p.m.	Tuesday, September 5 and Monday, September 11
Marshfield (Furnace Brook Jr. High)	5:30 - 8:00 p.m.	Tuesday, September 5 and Thursday, September 14
Milford H.S.	5:30 - 8:00 p.m.	Tuesday, September 5 and Tuesday, September 12
Norwood Jr. H.S. North	5:30 - 8:00 p.m.	Wednesday, September 6 and Wednesday, September 13
Reading (Austin Prep.)	5:30 - 8:00 p.m.	Tuesday, September 5 and Tuesday, September 12
Revere H.S.	5:30 - 8:00 p.m.	Tuesday, September 5 and Thursday, September 14
Weymouth North H.S.	5:30 - 8:00 p.m.	Wednesday, September 6 and Tuesday, September 12
Fall Quarter Classes Begin		Monday, September 25
Columbus Day Observed	No Classes	Monday, October 9
Veteran's Day Observed	No Classes	Saturday, November 11
Thanksgiving Recess	No Classes	Thursday-Saturday November 23-25
Final Examination Period for Fall Quarter		Monday-Saturday December 11-16

Winter Quarter 1978 - 1979

Classes Begin Tuesday, January 2, 1979

WINTER REGISTRATION DATES

Boston	5:30 - 8:00 p.m.	Monday-Friday December 4-8
Burlington	5:30 - 8:00 p.m.	Monday-Thursday December 4-7
Brockton (Cardinal Spellman H.S.)	5:30 - 8:00 p.m.	Thursday, December 7
Framingham North H.S.	5:30 - 8:00 p.m.	Monday, December 4 and Tuesday, December 5
Marshfield (Furnace Brook Jr. High)	5:30 - 8:00 p.m.	Tuesday, December 5
Milford H.S.	5:30 - 8:00 p.m.	Tuesday, December 5

Norwood Jr. H.S. North	5:30 - 8:00 p.m.	Monday, December 4 and Wednesday, December 6
Reading (Austin Prep.)	5:30 - 8:00 p.m.	Tuesday, December 5
Revere H.S.	5:30 - 8:00 p.m.	Tuesday, December 5
Weymouth North H.S.	5:30 - 8:00 p.m.	Wednesday, December 6 and Thursday, December 7
Christmas Vacation	No Classes	Monday-Monday December 18-January 1
Winter Quarter Classes Begin		Tuesday, January 2
Martin Luther King's Birthday	No Classes	Monday, January 15
Washington's Birthday Observed	No Classes	Monday, February 19
Final Examination Period for Winter Quarter		Monday-Saturday March 19-24
Spring Recess (or Make-Up Period for Lost Snow Days)		Monday-Saturday March 26-31

Spring Quarter 1979

Classes Begin Monday, April 2, 1979

SPRING REGISTRATION DATES

Boston	5:30 - 8:00 p.m.	Monday-Friday March 12-16
Burlington	5:30 - 8:00 p.m.	Monday-Thursday March 12-15
Brockton (Cardinal Spellman H.S.)	5:30 - 8:00 p.m.	Thursday, March 15
Framingham North H.S.	5:30 - 8:00 p.m.	Monday, March 12 and Tuesday, March 13
Marshfield (Furnace Brook Jr. High)	5:30 - 8:00 p.m.	Tuesday, March 13
Milford H.S.	5:30 - 8:00 p.m.	Tuesday, March 13
Norwood Jr. H.S.	5:30 - 8:00 p.m.	Monday, March 12 and Wednesday, March 14
Reading (Austin Prep.)	5:30 - 8:00 p.m.	Tuesday, March 13
Revere H.S.	5:30 - 8:00 p.m.	Tuesday, March 13
Weymouth North H.S.	5:30 - 8:00 p.m.	Wednesday, March 14 and Thursday, March 15
Spring Quarter Classes Begin		Monday, April 2
Patriot's Day Observed	No Classes	Monday, April 16
Memorial Day Observed	No Classes	Monday, May 28
Final Examination Period for Spring Quarter		Monday-Saturday June 11-16
Commencement		Sunday, June 17

Summer Quarter 1979

Classes Begin Monday, June 18, 1979

REGISTRATION FOR ENTIRE SUMMER QUARTER

Boston	5:30 - 8:00 p.m.	Monday-Friday June 4-8
Burlington	5:30 - 8:00 p.m.	Tuesday, June 5
Summer Quarter Classes Begin		Monday, June 18

REGISTRATION FOR SECOND FIVE-WEEK TERM

Boston	5:30 - 8:00 p.m.	Monday, July 16 and Tuesday, July 17
Burlington	5:30 - 8:00 p.m.	Monday, July 16
Independence Day Observed	No Classes	Wednesday, July 4
Labor Day Observed	No Classes	Monday, September 3
Final Examination Period for Summer Quarter		Held During Last Class Session of Each Term

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer and/or the Title IX coordinator.

Emergency Closing of the University

Northeastern University has made arrangements to notify students, faculty, and staff by radio when it becomes necessary to cancel classes because of extremely inclement weather. Radio stations WBZ, WEEI, WHDH, WJDA, WCOP, WRKO, WLYN, WKOX, WHAV, and WLLH will announce the University's decision to close.

In addition, the University maintains an emergency snow phone (262-SNOW). Whenever in doubt, call 262-SNOW and a taped message will indicate the status of classes.

Program Advisers

Program advisers are available day and evening by appointment in the University College Office. They are competent to assist the student in planning a program suitable to his or her general educational and career objectives. They can also answer questions relating to degree requirements, course sequence, and proper scheduling of courses. Appointments may be arranged by calling the University College Office (437-2400) or by coming in person to 102 Churchill Hall. There is no charge for this service.

Program advisers are also available during registration at all registration sites. No appointment is necessary.

Counseling and Testing Center

Counseling and testing to aid a student or prospective student with career, educational, or personal concerns is available days and certain weekday evenings until 8:30 p.m. Information regarding fees and appointments may be obtained by calling 437-2142, or by going to the Counseling and Testing Center, 302 Ell Student Center.

Changes

Academic programs, course content, and rules and regulations are subject to change without notice.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements, and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities, or performance, but its inability or failure to do so shall not subject it to liability.

NORTHEASTERN UNIVERSITY



the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. By special enactment, the State Legislature has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which comprises more than 178 distinguished business and professional men and women.

From its beginning Northeastern University's dominant purpose has been to identify community educational needs and to meet these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has pioneered new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, under which students alternate periods of work and study. The Plan was initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971).

This time-tested method of education offers students the opportunity to gain valuable practical experience as an integral part of their college programs and to contribute to the financing of their education. The co-op plan has been extended to the graduate level in engineering, actuarial science, professional accounting, business administration, rehabilitation administration, and law.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the graduate division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston campus, suburban campus in Burlington, and at other off-campus locations near Boston.

UNDERGRADUATE COLLEGES

Boston-Bouvé College

Boston-Bouvé College offers four major programs of study: physical education, recreation and leisure studies, and health education, leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching as well as leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

College of Business Administration

The College of Business Administration offers programs of study in principal fields of business leading to the Bachelor of Science degree in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students have the opportunity to gain practical experience as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development, which annually conducts intensive programs designed to provide professional growth for experienced managers. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the five-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy. The Center also conducts the Management Workshops scheduled on twelve Fridays, offering four core areas of management study.

The Bureau of Business and Economic Research provides administrative assistance on research projects carried out under faculty leadership and supervision.

College of Criminal Justice

The College of Criminal Justice offers a full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Science.

College of Education

The College of Education offers programs leading to the degree of Bachelor of Science in Education. Students in these programs have the opportunity to prepare for professional service as Elementary and Secondary school teachers, Speech-Language Pathologists or Audiologists, Music Education and Human Services workers. The Cooperative Plan is integral to all College of Education programs and offers a wide range of employment opportunities in school systems, libraries, social service agencies, clinics, and hospitals.

College of Engineering

The College of Engineering offers five-year cooperative curricula in civil (including an environmental engineering option), mechanical, electrical (including a power systems option and a computer engineering option),

chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A more general program without specification leading to the Bachelor of Science degree is offered where students design their curriculum around a core of science, engineering science, and engineering courses (for example, computer science). For highly qualified students, most departments offer a five-year program leading to both bachelor's and master's degrees; students carry course overloads beginning in the third year. The College also offers during evening hours part-time programs leading to Bachelor of Science degrees in Civil, Mechanical, and Electrical Engineering, extending over eight years and meeting the same qualitative and quantitative standards of scholarship as the day curricula.

College of Liberal Arts

The College of Liberal Arts offers majors in the arts and sciences leading to the Bachelor of Arts or Bachelor of Science degrees. Curricula are normally four years in length on a full-time plan or five years in length on the Cooperative Plan.

Lincoln College

Lincoln College offers engineering technology programs leading to the degrees of Associate in Engineering, Associate in Science, and Bachelor of Engineering Technology. These programs are made available as:

- (a) A full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Engineering Technology (B.E.T.) in Mechanical and Electrical Engineering.
- (b) A part-time evening program including pre-technology preparatory courses and degree programs leading to the Associate in Engineering (A.E.); and the Bachelor of Engineering Technology (B.E.T.) in Civil, Mechanical, and Electrical Engineering. The Associate in Science degree may be earned in the mathematical, physical, and chemical sciences.

The day B.E.T. program is often useful for the high school graduate or the student transferring from a community college or technical institute who desires the full-time day curricula on the Northeastern Cooperative Plan.

In addition to its traditional curricula, Lincoln College Evening School offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet special needs of the part-time student.

College of Nursing

The College of Nursing offers three programs organized on the Cooperative plan:

- (a) A three-year curriculum (with three cooperative educational periods) leading to the Associate Science degree in Nursing. An option is offered to the licensed practical nurse to earn an Associate Science Degree in Nursing in a two year period. Candidates for this program are not required to have cooperative education experiences.
- (b) A five-year curriculum (with seven cooperative educational periods) leading to a Bachelor of Science degree in Nursing.

All of the above are designed to qualify the graduates to write the Commonwealth of Massachusetts licensing examinations for Registered Nurse.

The baccalaureate program provides registered nurses the opportunity to earn a Bachelor of Science Degree in Nursing. In the event of sufficient nursing-working experience, cooperative periods are waived.

Cooperative educational experiences and clinical nursing laboratories are provided by approximately twenty-five (25) metropolitan and suburban hospitals.

College of Pharmacy and Allied Health Professions

The College of Pharmacy and Allied Health Professions offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy, Bachelor of Science in Respiratory Therapy, Bachelor of Science in Toxicology, and to the Bachelor of Science degree with majors in medical laboratory science and medical record administration. Associate degree programs are offered in medical laboratory technician, respiratory therapy, and dental hygiene. The College has academic responsibility and, in cooperation with the medical schools and teaching hospitals in the Boston area, offers the professional program for physician assistants.

University College

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time day and evening programs in liberal arts, business administration, law enforcement, education, health professions, and therapeutic recreation service programs, leading to the Associate in Science, Bachelor of Arts, and Bachelor of Science degrees. It does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students. Students may pursue a degree or simply take courses, based on needs and interests, up to a total of 39-40 quarter hours of credit. Courses are offered in Boston as well as in Burlington, Framingham, Milford, Revere, Weymouth, Brockton, Norwood, Marshfield and Reading.

Adult Day Programs refers to University College courses that are offered Monday through Friday, 9:00 a.m. to 5:00 p.m., to meet the needs of adults with family or other obligations who wish to engage in part-time study dur-

ing the day. In addition to the daytime offering of regular University College credit courses, Adult Day Programs also offers daytime workshops and conferences, sometimes over weekends, with the option for credit. Adult Day Programs are offered primarily on the Boston and Burlington campuses, with a limited number of courses offered at other off-campus locations.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

Alternative Freshman-Year Program

A special Alternative Freshman Year Program has been developed in collaboration with University College to serve some students who seek admission to the Basic Colleges. If the professional counselors in the Department of Admissions identify an applicant who seems to have a reasonable chance for success in college work, but has a secondary school record of uneven quality, they may recommend that such a student enroll in the Alternative Freshman Year Program, where his or her individual needs could be better served. Under this plan, the students are provided with a self-paced, flexible pattern of instruction, allowing them to take as few or as many courses as they can handle successfully. This program also provides students with an opportunity to gain confidence in doing college level work and to sample different areas of interest prior to committing themselves to a specific major field of study.

GRADUATE SCHOOLS

Actuarial Science

Master of Science in Actuarial Science

Arts and Sciences

The Master of Arts degree may be earned in economics, English, history, political science, psychology, sociology, and social anthropology. The Master of Science degree is available in biology, chemistry, economics, mathematics, and physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the Doctor of Philosophy Degree in biology, chemistry, economics, mathematics, physics, psychology, and sociology.

Boston-Bouvé College

Master of Science with specializations in physical education and recreation and leisure studies.

Business Administration

Master of Business Administration.

Criminal Justice

Master of Science in Criminal Justice; in conjunction with the Institute of Chemical Analysis, Application and Forensic Science, the Master of Science and Doctor of Philosophy in Forensic Chemistry.

Education

Master of Education, the Certificate of Advanced Graduate Study, and Doctor of Education.

Engineering

Master of Science Degrees are offered with course specifications in the fields of Civil, Chemical, Electrical, Industrial, Mechanical, Transportation, and Engineering Management. A six year program leading to both a bachelor's and master's degree is offered in Electrical Engineering, Mechanical Engineering, and Power Systems. Professional Engineers Degrees are offered in Electrical, Industrial, and Mechanical Engineering. Ph.D. Degrees are offered in Civil, Chemical, Electrical, and Mechanical Engineering. A Doctor of Engineering Degree in Chemical Engineering is offered in addition to the Ph.D.

Law

The School of Law offers a full-time program of professional instruction leading to the degree of Juris Doctor (J.D.). The three-year curriculum includes twelve months of experience in law offices, governmental agencies, or other law-related employment. There are no courses for part-time or evening students.

Pharmacy and Allied Health Professions

Master of Science with specialization in Clinical Chemistry, Hospital Pharmacy, Medicinal Chemistry, Pharmacology, Medical Laboratory Science, Radiopharmaceutical Science, and Doctor of Philosophy in Medicinal Chemistry with specialization in Biopharmaceutics, Clinical Chemistry, Medical Laboratory Science, Pharmacology, and Radiopharmaceutical Science, as well as an Interdisciplinary Doctor of Philosophy program in Forensic Chemistry.

Professional Accounting

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

INSURANCE INSTITUTE

The Insurance Institute is sponsored by local insurance organizations and companies. It offers a number of non-credit courses in preparation for the Chartered Life Underwriter and Chartered Property-Casualty Underwriter Designations as well as for the General Insurance, Insurance Adjuster, and Risk Management Certificates. A Master of Science degree in Financial Services is offered. (437-2506).

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers several programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



NORTHEASTERN UNIVERSITY

buildings and facilities

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 50 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Carl S. Eli Student Center

The Carl S. Eli Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

The University Library

The University Library System includes the Dodge Library and the three graduate libraries: Chemistry, 112 Hurtig Hall that includes Chemical Engineering, Biology, Pharmacy and the Health Sciences; Physics/Electrical Engineering, 324 Dana Hall; and Mathematics/Psychology, 531 United Realty Building. The Suburban Campus Library supports the programs at Burlington. Other collections are Marine Science at Nahant, Center for Management Development at Andover, and Aviation Technology at Norwood. There is also the Law Library located in the Knowles Center, and the Curriculum Resources Library in Cahners Hall.

The University Library collections consist of over 412,000 bound volumes, and 452,300 microform volumes. The periodical titles number 4,000, additional continuation titles of 1,243, and 10,000 sound recordings.

1. The Reference Collection in the Cabot Reading Room on the main floor of the Dodge Library contains 20,000 volumes. This collection is of major importance to anyone using the Library. The researcher should be aware of the source books, handbooks, bibliographies, etc., before beginning an investigation of the literature.

The Reference Division includes the Government Documents Collection located in 14 Dodge, and the Microforms Collection located in 108 DG. Additional sources of information are the Business Services, Technical Reports, Annual/Company Reports, and the Information File for pamphlet materials.

2. The Periodical Collection in the Webster Reading Room on the main floor consists of Indexing and Abstracting Services, and the current periodicals, mainly in literature, humanities, social sciences, and general science, as well as foreign and domestic newspapers.

This collection supports the Reference Collection and brings up-to-date the General Collection by encompassing the latest developments in all fields of knowledge.

The Periodical Stacks are adjacent to the collection and are serviced by the library staff.

3. The General Collection is located on the three floors and two stack levels of the Dodge Library indicated by posted floor plans and guides available at the Information Desk.

4. The Reserve Book Collection is located in 204 Dodge. This is an important and heavily-used collection of textbooks and assigned reading to support the classroom lecture, laboratory, and for further in-depth information.

5. The Public Catalog located on the main floor includes author, title, and subject cards for the foregoing collections, except for documents, technical reports, and complete entries for periodicals which will be found in catalogs in those areas. The Public Catalog includes both the Dewey Decimal classification, and since April, 1971, the Library of Congress classification.

6. The Circulation Department manages the organization of the General Collection. Materials are charged out and returned at the Circulation Desk. A daily computer printout of items on loan is available to assist in locating books not found on the shelves.

7. The Inter-Library Loan Department is located in 18 Dodge. This service should be used for materials not available in the system and for serious research.

8. The Music Reference Service is located in 406 Dodge. This collection of books, scores, records, and tape cassettes is for assigned listening and personal enjoyment. The collection contains both music and spoken word.

9. The Learning Resources Center, 406 Dodge, is a service for programmed and language instruction utilizing audio/visual/video equipment teaching programs to support classroom work and independent study.

10. It should be understood that the Divisional Libraries, the Burlington Campus, and the Law School Library have the same services and card catalogs to support those disciplines.

LIBRARY HOURS

Dodge Library

Mon.—Thurs.	7:45 a.m. to 10:00 p.m. (10:00 p.m. to midnight)*
Friday	7:45 a.m. to 7:30 p.m.
Saturday	12:00 noon to 5:00 p.m. (5:00 p.m. to 10:00 p.m.)*
Sunday	12:00 noon to 5:00 p.m. (5:00 p.m. to midnight)*

*References and Periodicals; for study only.

Divisional Libraries

Mon.—Thurs.	8:30 a.m. to 10:00 p.m.
Friday	8:30 a.m. to 7:30 p.m.
Saturday—	
Sunday	Closed

Suburban Campus Library

Mon.—Fri.	8:30 a.m. to 9:00 p.m.
Saturday	8:30 a.m. to 1:00 p.m. (alternate Saturdays)
Sunday	Closed

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouve College.

The Barletta Natatorium houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark room, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, business administration, education, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is located twelve miles from the main campus.

Warren Center

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouve College. There are facilities for conferences, special education in arts and crafts, and sports—including aquatics. Buildings include a lodge, cottages, and an infirmary.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, located about twenty miles northeast of Boston, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated throughout the year.

university college

John W. Jordan
Acting Dean, University College

The Programs

University College is committed to the education of mature, adult students who wish to live effectively in today's complex society. The programs in the College are specifically designed to satisfy the changing professional, cultural, and social needs and interests of adults. They are constantly evaluated, and redesigned when necessary, to keep pace with students and community.

Degree programs have been developed in 39 major fields of study in the areas of business administration, education, liberal arts, law enforcement, recreation, and health. Courses are offered on a part-time basis Monday through Saturday during day and evening hours convenient for adults. Students may elect single courses or may enroll in full-degree programs leading to the Associate in Science or the Bachelor's degree. Short-term seminars are also offered for credit. Classes are scheduled in locations which are accessible to the urban and the suburban community. Students may attend classes at the Huntington Avenue campus, Boston, or the suburban campus in Burlington, Massachusetts, as well as other off-campus locations north, south, and west of Boston.

The Faculty

Approximately 950 men and women comprise the part-time teaching staff of University College. Included are members of the full-time faculty of the Basic Colleges of Northeastern University and other educational institutions in New England, as well as outstanding New England business and professional leaders with backgrounds of training and experience in specialized areas. The faculty are selected because they are highly successful in their fields and are well qualified to provide sound methods of teaching for adults in an interesting, inspiring, and effective manner.

The Student Body

The student body of University College represents the diversity of interests that is one of the basic strengths in adult education. Approximately 12,000 students range in age from 18 years to beyond retirement. Some enroll immediately after high school graduation. Others may have graduated several years ago.

University College students can have full-time commitments to their jobs, families, or other responsibilities. They may enroll in a single course or in a full degree curriculum, depending on whether their goal is job advancement, a new career, or personal enrichment.

UNIVERSITY COLLEGE AND ADULT EDUCATION ADMINISTRATIVE OFFICERS

- John W. Jordan, B.S., M.Ed., *Acting Dean of University College*
Ann A. Barto, A.S., *Assistant Director of Administrative Services*
Richard J. Comings, A.B., M.A., *Associate Director of Academic and Student Services & Director of Student Activities*
Joseph N. Connors, A.S., B.S., M.P.A., *Assistant Dean and Associate Director of Law Enforcement Programs*
Edward J. Czarnowski, B.S., Ed. M., C.L.U., *Director of Insurance Institute*
Michael S. Dvorchak, B.A., M.A., *Assistant Dean and Director of Suburban Campus*
William T. Edgett, A.B., M.A., *Assistant Dean and Director of Counseling*
Norma M. Fink, B.A., M. Ed., *Coordinator of Women's Career Project*
David R. Kane, B.S., *Registrar*
Marjorie Koretsky, B.S., M.Ed., *Assistant Dean and Director of Allied Medical Health Programs*
Paul D. Maxwell, B.S., M.B.A., *Associate Dean and Director of Business Administration Programs*
Timothy F. Moran, B.S., M.Ed., *Associate Dean and Director of Law Enforcement, Correctional & Security Programs*
Harold Naidus, A.B., M.S., Ph.D., *Associate Dean and Director of Liberal Arts Programs*
Ellen G. O'Brien, B.A., M.Ed., *Assistant Director of Academic and Student Services*
Donald M. Phillips, B.A., *Assistant Registrar*
Jacqueline Platt, B.S., M.Ed., *Director of Counseling, Suburban Campus*
Kenneth C. Solano, A.B., M.Ed., *Associate Dean and Director of Academic and Student Services*
Ralph T. Vernile, Jr., B.S., *Associate Dean of Adult Education and Director of Administrative Services*
Marilyn S. Wiener, A.B., M.A., *Associate Dean, Director of Women's Programs and Therapeutic Recreation Programs*

Executive Committee

John W. Jordan, *Chairperson*

Marjorie Koretsky
Paul D. Maxwell
Timothy F. Moran
Harold Naidus

Kenneth C. Solano
Ralph T. Vernile, Jr.
Marilyn S. Wiener

Committee on Academic Standing

John W. Jordan, *Chairperson*

Marjorie Koretsky	Harold Naidus
Paul D. Maxwell	Kenneth C. Solano
Timothy F. Moran	Marilyn S. Wiener

Committee on Regulations and Discipline

John W. Jordan, *Chairperson*

Richard J. Comings	Harold Naidus
Marjorie Koretsky	Kenneth C. Solano
Paul D. Maxwell	Marilyn S. Wiener
Timothy F. Moran	

Library Committee

Richard J. Comings, *Chairperson*

Marvin Lesser	Timothy F. Moran
Paul D. Maxwell	Harold Naidus

Ex Officio

John W. Jordan

Business Administration Curriculum Committee

Paul D. Maxwell, *Chairperson*

W. Arthur Gagne	Robert Hehr
Robert Goldberg	Thomas J. McNamara
Ronald E. Guittarr	Joel Rosenfeld

Three Student Representatives

Ex-Officio

John W. Jordan

Law Enforcement Curriculum Committee

Timothy F. Moran, *Chairperson*

Joseph Connors	Norman Rosenblatt
Robert Croatti	

Three Student Representatives

Three Faculty Representatives

Ex Officio

John W. Jordan

Liberal Arts Curriculum Committee

Harold Naidus, *Chairperson*

Fletcher Boig	Roland L. Nadeau
Harold Goldstein	Raymond H. Robinson
Harlan Lane	David Schmitt
Lila Leibowitz	Robert Wells
Marvin X. Lesser	Henry Werntz

Three Student Representatives

Three Part-Time Faculty Representatives

Ex Officio

John W. Jordan

Health Professions Curriculum Committee

Marjorie Koretsky, *Chairperson*

Judy Barr	Helen Glazer
Sandra Best	Craig Mellin
Stanley Bozen	Barbara Schulze
Annalee Collins	Judy Weilerstein
Richard Comings	Marilyn Wiener

Two Student Representatives

Therapeutic Recreation Curriculum Committee

Marilyn Wiener, *Chairperson*

Sheryl Fairchild	Frank Robinson
Jacalyn Hamada	John Shank
Davis Johnson	Janet Swanson
Herbert Richmond	Roberta Winitzer

academic policies

Academic and Student Services

Kenneth C. Solano, *Associate Dean, Director of Academic and Student Services*

Richard J. Comings, *Associate Director of Academic and Student Services*

William T. Edgett, *Assistant Dean, Director of Counseling*

Ellen O'Brien, *Assistant Director of Academic and Student Services*

Telephone: (617) 437-2400

All registrants who satisfy the requirements as regular or special students are admitted as part-time students in University College without the requirement of filing a formal application in University College. It is advisable for students to have an interview with an Academic Counselor, prior to registration, to help plan their academic program in University College, particularly in cases where previous credit has been earned at other institutions, in order to avoid possible duplication of courses. Because of the diversity of the University College student body in terms of individual background, age, interests, and needs, no entrance examinations are required. In lieu of entrance examinations, a student is expected to maintain a quality point average of at least 2.0 (C average on a four point grading system) in order to be admitted as a degree candidate at the point of matriculation.

Regular Student Status

To be considered a regular student, i.e., to become a degree candidate in one of the programs offered by University College, a student must have completed an approved secondary school program consisting of 15 units* of high school courses or the equivalent. High School Equivalency Certificates are accepted in lieu of actual High School graduation. All students who become degree candidates shall follow the prescribed curriculum in their program.

Special Student Status

Special students are those who do not wish to enroll in a degree program, but who are interested in pursuing in any one quarter one or more courses appropriate to their needs or general interests. Credits earned for these courses may be applied to a degree program if the student desires to pursue a degree at a later time.

* A unit represents a year's work in any subject in any approved secondary school constituting approximately a quarter of a full year's work or the equivalent. A four-year day high school course is regarded as representing at least 15 units of work, or 3 units in junior high school and 12 units in a three-year high school.

Matriculation—Procedure for Admission as a Degree Candidate

Petition forms for admission to the status of a degree candidate are available at the Office of Academic and Student Services of University College and at all Branch Campus offices.

Qualified students may be matriculated (degree candidate status) upon filing the Petition for Matriculation under one of the following options.

Option I. (Non-Transfer Students)

A student who is a graduate of a regionally-accredited** or state-approved high school or who has the equivalent of a high school education by having earned a High School Equivalency Certificate may be considered eligible to become a degree candidate if the student has successfully completed 39 quarter hours in University College with a 2.0 or C average as residence credit.

Option II. (Transfer Students)

A student who has earned an Associate degree or has completed the equivalent of 39 quarter hours at another regionally accredited institution** may become a degree candidate after the completion of one quarter at University College with a 2.0 Q.P.A. or C average in all courses in residence. The combined total of transfer credit and residence credit must equal at least 39 credits.

Any student who files for matriculation, whether under Option I or Option II, must have a high school diploma from a regionally-accredited** or state-approved high school or a High School Equivalency Certificate, a cumulative quality point average of at least 2.0, and, if pursuing a Liberal Arts or Law Enforcement Program, 9 quarter hours of English I, II, III.

Advanced Standing Credit

Transfer Credit from Another Institution

Subject to the approval of the Director of Academic and Student Services, transfer credit from accredited** institutions of higher education may be accepted when the grade earned and course(s) completed are applicable to the student's program in University College.

A student who wishes to obtain a tentative evaluation of previously earned credits from another institution must file a Petition for Advanced Standing Credit with the Director of Academic and Student Services of University College. The student should then write to the Registrar of the institution(s) previously attended and request that an official (sealed) transcript be forwarded to the Director of Academic and Student Services of University College. The transcript(s) should indicate honorable dismissal, courses

** An institution having recognition and membership in one of the six regional accrediting associations recognized by the National Commission on Accrediting.

completed, credits, and grades earned. Students who have been dismissed from other institutions for academic or other reasons must enclose with their petitions a statement from the dean or other appropriate official of that institution stating reasons for dismissal or probationary status. The statement should include a recommendation for acceptance in University College.

Upon receipt of the above-mentioned material, the Director of Academic and Student Services will issue a tentative evaluation of all previously completed courses as they apply to the student's program. The tentative award will be recorded on the student's transcript when matriculation is approved.

Credit By Examination

University College will award credits by examination provided there is no duplication of other previously earned academic credit. Credit is granted for successful completion of appropriate examinations currently available through the College Level Examination Program (CLEP) of the College Entrance Examination Board and through the Proficiency Examination Program (PEP) of the American College Testing Program. Both programs have been designed to assist the student in acquiring college-level credit for knowledge acquired through non-traditional means, such as on-the-job training, educational television, correspondence and extension study, as well as independent study. Information about these programs is available in the University College office and at the Counseling and Testing Center of the University.

Evaluation of Foreign Educational Credentials

Students requesting an evaluation of Foreign Educational Credentials for transfer credit in University College will be assessed a fee of \$15.00 for the evaluation. The evaluation will be issued by the Director of Academic and Student Services upon receipt of the petition for Advanced Standing Credit, official copies of all transcripts that have been translated into English, and a check in the amount of \$15.00 made payable to Northeastern University.

The official assessment of Foreign Educational Credentials will be made in accordance with current standards for Advanced Standing Credit in University College or as recommended by the Center for International Higher Education Documentation.

The \$15.00 fee will be waived for any University College student who has matriculated prior to requesting the evaluation.

Non-Collegiate Experience Credit

Law Enforcement students may be granted credit in their program, up to 18 quarter hours, by successfully completing one or more of the non-collegiate credit examinations which have been made available through their program director's office. Examinations are periodically scheduled by the Counseling and Testing Center.

Liberal Arts students may petition for non-collegiate experience credit through their major adviser if they are matriculated in a Liberal Arts program with a departmental major.

Credit cannot be awarded through non-collegiate experience petitions or examinations when an appropriate examination is available through CLEP or PEP.

See pages 101 (Law Enforcement) and 75 (Liberal Arts) for more details on opportunities for non-collegiate experience credit.

Residence Requirement

Every candidate for the baccalaureate or associate degree must fulfill the residence requirement. The residence requirement is defined as the satisfactory completion in University College immediately preceding graduation of 45-46 consecutive quarter hours of work in course, with the further provision that at least 12 of the 45-46 quarter hours must be in the candidate's major field. All programs to meet the residency requirement must have the approval of the Dean. Students whose attendance in degree programs is interrupted for a period of one year or more will be reinstated into the program in effect at the time of their re-entry into University College.

In the case of students who, for causes beyond their control, move outside of the reasonable commuting area of the College, and who have completed 134 or more quarter hours of credit, the Committee on Academic Standing will entertain a petition to allow them the privilege of completing their degree requirements at some other approved college. Under no circumstances will a degree be awarded to any student who has completed less than 45-46 quarter hours of credit in courses in University College.

Senior Status Procedure

All potential degree recipients will be polled during the fall quarter as to their intention to graduate during the current academic year. A Commencement Data Card, indicating a student's wish to be considered for graduation, is required prior to the winter quarter of the final year in residence to be officially designated a degree candidate for the next Commencement Exercise in June. September graduates will be polled during the month of June.

Quality Requirement for Graduation

A cumulative quality point average of 2.00 (an average grade of C) is required for graduation. Advanced standing credits are not averaged in the cumulative score.

Graduation with Honor

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with

highest honor. To be considered for graduation with honor, a student must have completed a minimum of 72 quarter hours of work at University College. Courses credited by advanced standing will be eliminated in determining honor graduates.

Attendance at Commencement

Attendance at commencement for all University College degree candidates is optional. Degree candidates will be polled by the commencement committee in this regard during the spring quarter.

Quality Points

The requirement for graduation from University College is 174 quarter hours for a bachelor's degree and 96 quarter hours for an associate's degree, with attainment of a quality point average of 2.0. Although the credits allowed for acceptable work completed elsewhere by transfer students count toward fulfillment of quantitative graduation requirements, neither the credits nor the grades earned in such courses are included in quality point computations for graduation.

The method of figuring quality points is as follows: each quarter hour credit of A grade is multiplied by 4, B grade by 3, C grade by 2, D grade by 1, and F grade by 0. The total number of quality points, divided by the total number of quarter hour credits completed, shall be the quality point average.

Students receiving an F grade in a required course must repeat the course in its entirety including term work, examinations, and attendance.

Dean's List

All matriculated students who have taken a minimum of 27 quarter hours in three consecutive quarters (fall, winter, spring) of an academic year and have completed all their courses with an average of 3.0 or better shall be placed on the Dean's List. Each student shall receive a certificate of commendation from the Dean of University College.

Pass-Fail Courses

Any student who is not on academic probation and who has completed 39 q.h. of academic work may register for one pass/fail course and, thereafter, for one course on a pass/fail basis for each 15 q.h. of successfully completed work. Written permission of the appropriate academic dean must be obtained for each pass/fail course. At no time may a student register for more than one pass/fail course per quarter.

Such courses will be restricted to free electives outside the major field of specialization, so that no part of the specifically prescribed curriculum will be affected.

The grades recorded on the basis of the pass/fail system of grading will not figure in the computation of the QPA.

Satisfactory completion of the work in all courses taken on the pass/fail system of grading will be designated on the transcript by the letter "S." Unsatisfactory work will be designated on the transcript by the letter "U." Any unsatisfactory grade must be handled according to the existing policy of the University, but must never be cleared through the election of the same course on the basis of the pass/fail system of grading.

An incomplete in a course taken on a pass/fail basis will be designated by the letter "X" on the transcript and must be treated according to the normal procedure for incomplete grades.

The following REGISTRATION PROCEDURES shall prevail:

Students wishing to use the pass/fail system of grading for a course must meet all prerequisites for the course and should signify their desire to apply for a specific course on the basis of this system of registration.

The student's decision to take a course on a pass/fail basis must be made prior to the second meeting of the course and no changes will be permitted thereafter.

Class Changes

University College reserves the right to cancel, split, or combine classes when necessary.

Registration

Before attending classes, students must report to the registration area to register. All students must complete their registration properly before attending class. Attendance at class, even with the instructor's permission, does not constitute registration.

No academic credit will be recorded for students not properly registered.

In order to insure academic success, students are strongly advised to adhere to course prerequisites.

Class Attendance

Students are expected to attend all exercises in the subjects they are studying unless excused in advance.

Absence from regularly scheduled exercises in any subject will seriously affect the standing of the student. Consecutive absences may cause the removal of the subject or subjects from the student's schedule.

Class Preparation

It is expected that University College students will spend an average of six to eight hours per week on outside assignments for each course.

Withdrawal Policy

A student may be withdrawn from a course in several ways:

VOLUNTARY WITHDRAWAL—The student completes a drop course form

in the Registrar's Office or notifies the Registrar in writing of his or her intention to withdraw from the course.

INITIAL ABSENCE WITHDRAWAL—If after the first class meeting a student misses two consecutive class meetings of a course, he or she will be withdrawn by the Registrar.

END OF COURSE WITHDRAWAL—If, by the ninth or tenth week of the quarter, the Registrar, after examining the attendance book, has every reason to believe the student has dropped from the course, he will officially withdraw the student and so note in the attendance book.

Change of Address

Change of address and/or name should be reported immediately to the Registrar's Office.

Absence Because of Illness

All students who are absent from school because of extended illness, and do not wish to be withdrawn, should inform the Registrar's Office by letter.

Examinations

Term tests are scheduled in each quarter at the option of the instructor and are regarded as part of the term's course work. A final examination will be held at the end of each quarter in each course unless an announcement to the contrary is made.

Homework Assignments

Students are responsible for obtaining their homework assignments by contacting their instructor or another student in their class. Homework assignments are not available in the University College Office.

Missed Final Examinations

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege and must pay a fee of \$5.00 for each special examination when filing for the special make-up exam. All students who wish to clear an I (incomplete) grade must pay the fee and file the proper petition in the Registrar's Office, 120 HA, or in each off-campus administrative office. Petitions for missed finals must be filed in accordance with the schedule listed below:

final examination missed during:

Fall Quarter 1978
Winter Quarter 1979
Spring Quarter 1979
Summer Quarter 1979

file petition no later than:

January 12, 1979
April 13, 1979
July 6, 1979
September 28, 1979

Students will be notified by mail of when and where to take the missed final examination. All examinations will be administered on the Boston Campus approximately two months after the quarter ends.

Students who do not take make-up final examinations as scheduled (see below for I grade explanation) and clear an incomplete through the instructor will be billed the \$5.00 make-up exam fee by the Bursar before the I grade is changed.

Grading System

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

A (4.0)—Outstanding	L—Audit (No Credit)—UC and LC only
B (3.0)—Good	S—Satisfactory (Pass-Fail Grade)
C (2.0)—Satisfactory	U—Unsatisfactory (Pass-Fail Grade)
D (1.0)—Poor	X—Incomplete (Pass-Fail Grade)
F (0.0)—Failure	* —Grade not received
I (—)—Incomplete	

A general average of D is unacceptable and will not allow a student to continue in University College or to receive a degree from Northeastern University. The F grade is a definite failure and requires repetition of the course in its entirety. The I grade is given only when the student fails to take the final examination.

The I Grade

The I grade may be given only when the student fails to take the final examination.

An instructor may decide that a student has done so poorly in the course that even a perfect grade in a make-up final could not raise the grade from F, in which case F is the proper grade, irrespective of the missed final.

If the student fails to complete some other major portion of the course work (examination, quizzes, major paper, etc.) a letter grade (A, B, C, D, F) should be assigned. This grade can be changed, upon petition, when the deficiency which led to the assigned letter grade is made up to the satisfaction of and in the manner prescribed by the instructor.

All deficiencies must be made up in the prescribed manner no later than twelve months following the recording of the grade.

*Grade Reports

An official grade report will be mailed approximately three weeks after the quarter is completed to each registered student. Grades will not be given over the telephone or at the Registrar's Office.

* A supplementary grade report will be issued when the missing grade is received. Please do not call the Registrar's Office for it. University regulations prohibit issuing grades by telephone. S, U, X, I, and L grades are not included in the Quality Point Average. S grades are included in "Earned Hours" toward the degree. Cumulative totals do not appear on reports for non-matriculated students.

Auditing Policy

Students are permitted to audit courses upon filing the usual registration forms and paying the regular tuition fees. There is no reduction in fees for auditing. An auditor may participate in class discussion, complete papers and projects and take tests and examinations for informal evaluation, if desired. However, regardless of the amount or quality of work completed, **no academic credit will be granted at any time for courses audited.**

Audit Procedure

The student's decision to take a course on an audit basis must be communicated in writing to the Registrar prior to the fourth class meeting of the course. No exception to this procedure can be approved without authorization by the Academic Standing Committee of the College.

Calculation of Quality Point Average

1. When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality point average.
2. A grade of I will not be considered in the calculation of quality point average.
3. Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality point average computations.

For example, a student who has registered for seven courses, cleared a failure in one of them, and received advanced standing credit (ASC) in another, may calculate the quality point average as follows:

Grade Achieved	Numerical Equivalent	Credit Hours	Quality Points
A	4.0	X 4 =	16.0
B	3.0	X 4 =	12.0
C	2.0	X 3 =	6.0
D	1.0	X 3 =	3.0
F	0.0	X 2 =	0.0
FB	3.0	X 2 =	6.0
I	—	X — =	—
ASC	—	X — =	—
Totals 18			43.0

$$\text{Quality Point Average} = \frac{\text{Total Quality Points (43.0)}}{\text{Total Credit Hours (18)}} = 2.389$$

Academic Probation

Students whose scholarship in any given period is unsatisfactory may be dropped from the College or may be placed on probation.

Disciplinary Action

The Committee on Regulations and Discipline has the authority to dismiss from the College or place on probation at any time or to strike from the list of candidates for the degree, any student deemed unworthy because of conduct or character.

Maximum Course Load

New students may elect up to four (4) subjects per quarter without special permission.

Former students who are not on the Dean's List may also elect up to four (4) subjects per quarter without special permission.

Dean's List students may elect any number of subjects per quarter not to exceed eighteen (18) quarter hours without special permission.

Not all the courses listed in this bulletin will be offered. A final list of those classes to be offered will be contained in the University College Schedule of Courses which gives the hours, days, and location of classes. This schedule is issued prior to the fall, winter, spring, and summer quarters.

Changes In Requirements

The continuing development of University College forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he or she entered becomes the binding one.

tuition and fees

Tuition and fees are refundable only as stated under "Refund of Tuition." Checks and drafts for all charges are to be drawn to the order of North-eastern University.

Tuition for Courses in Other Departments or Colleges of the University

University College students assigned to courses in other departments or colleges of the University are charged the tuition rates and other fees effective in the departments or colleges in which they are enrolled.

Initial Registration Fee

A ten dollar (\$10.00) registration fee, required of all new students, is due and payable upon registration. This fee is nonrefundable.

Tuition

Tuition for all credit courses is \$38.00 per quarter hour of credit. Charges for registration and tuition for special courses are at the rate specified for each course. Students are permitted to audit courses; there is no reduction in fees for auditing.

Non-credit courses are charged at quarter hour rates comparable to those of credit courses meeting on an equivalent contact hour schedule.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing or permitted to re-enroll in the University, nor will degrees be conferred until all financial obligations to the University have been met.

No certificate of honorable dismissal will be issued to any student who has not fully met all financial obligations to the University.

Tuition Budget Payment Plans

Occasionally situations develop—usually beyond the control of the student—which make it difficult to meet the payments in the manner outlined above. Under such circumstances the student is advised to discuss the problem personally at the Bursar's Office, where one of the budget plans or a deferred payment agreement may be worked out. Such arrangements should be made before the end of the first week of the quarter or within one week of the date of registration if the student enters late. A charge of \$2.00 will be made. Failure to take immediate action will result in a late payment fee of \$10.00.

Tuition Underwritten by Employers

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases where payment is to be made directly by the employer to the University, the student should furnish to the Bursar's Office a purchase order covering registration or a statement from an officer of the company certifying that the company is underwriting the tuition.

Veterans' Benefits

Any veteran covered by Public Law 89 - 358 should report to Room 108 Hayden Hall to fill out the proper enrollment forms.

Late Payment Fee

Bills for tuition and fees are payable in accordance with the due date shown. A late payment fee of \$10.00 may be charged to all students failing to comply unless special payment arrangements are approved by the Bursar's Office.

Refund of Tuition

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specific conditions are met. Questions regarding refunds should be discussed with the Bursar.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar in Room 120 Hayden Hall. Non-attendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

official withdrawal filed within:	percentage of tuition
1st week of quarter	100%
2nd week of quarter	75%
3rd week of quarter	50%
4th week of quarter	25%

Student Center Fee

All students in University College on the Huntington Avenue Campus are charged \$.75 each quarter for the services available in the Student Center.

Laboratory Fee

All students enrolled in biology or health professions courses which include laboratory must purchase from the Bursar's Office a Laboratory Fee and Deposit Card for \$15.00 (\$5.00 for extra cards). For chemistry, the

cards cost \$20.00 per quarter with the possibility of a \$5.00 refund at the end of the quarter, depending upon breakage. The fee for arts and crafts courses is \$5.00. Upon completion of the course or withdrawal during the quarter, the student must check his or her status with the laboratory attendant. The Bursar's Office will then refund any unused balance shown on the Laboratory Fee and Deposit Card.

Graduation Fee

The University graduation fee, charged to those who are candidates for the baccalaureate or associate degree, is \$25.00 payable on or before May 1 of the year in which the student expects to graduate.

Missed Final Examination Fee

Students absent from the regularly scheduled final examination at the end of a course may petition for a "Missed Final Examination." The fee for each examination requested by the student is \$5.00. The fee must be paid when the petition is filed in the University Registrar's Office.

Transcripts

Students may request transcripts of their grades at the Registrar's Office. There is a charge of \$1.00 per copy, payable in advance.



financial aid and scholarships

General information pertaining to financial aid opportunities and specific scholarship applications for part-time students are available in the University College Academic & Student Services Office, Room 102 Churchill Hall.

The following scholarships and awards are available to students enrolled in University College.

SCHOLARSHIPS

Professor Joseph A. Mullen Scholarships

The Massachusetts Chapter of the American Society of Training and Development has established a fund to provide annual scholarship awards to deserving part-time students upon the recommendation of the Dean of University College.

Martin Luther King Jr. Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King Jr. Awards are made as openings occur, to a limited number of adults from minority groups who would otherwise be unable to continue their education. Stipends can cover tuition expenses not to exceed six quarter hours in any academic quarter (excluding Summer Quarter).

Kappa Tau Phi Scholarships

The Kappa Tau Phi Sorority Scholarship Fund annually makes available scholarship awards. They are granted to women students in the liberal arts, business, and engineering programs, respectively, who rank highest at the end of the upper-middle year. In the event the student is eligible for an award of greater monetary value, the award will be made to the next highest-ranking woman student. To be eligible for this scholarship, the student must be enrolled in a program of at least two evenings per week and must be a candidate for the bachelor's degree. In determining the recipient, grades of all courses completed in prior years shall be considered.

Harry Olins Scholarship

The Harry Olins Scholarship Fund was established as an expression of firm belief in University College students and "what they stand for." The fund, presented by Mrs. Harry Olins in recognition of her husband's long service on the business faculty, makes available an annual tuition award to students who in terms of scholastic achievement, character, and personal need best typify the spirit of Northeastern University.

To be eligible for this award, the student must be a business administration degree candidate and carry a full academic load during the school year.

Pilot Freight Carriers Scholarships

Pilot Freight Carriers, Winston-Salem, North Carolina, awards \$500 annually to advanced transportation students who have achieved high academic standing and who have paid their tuition expenses without prior aid. The award may be shared by more than one student. Qualified candidates should apply during the Spring Quarter, in University College, 102 Churchill Hall. The final determination is made by the Dean of University College.

H. Patricia Taylor Scholarship Fund

The H. Patricia Taylor Scholarship Fund was established in 1974 by H. Patricia Taylor, a graduate of University College, and her husband, Harry C. Taylor, a graduate of the School of Business. The Scholarship expresses their appreciation for financial assistance made available to Mrs. Taylor while obtaining her degree, and is an attempt to provide similar funds to assist others in realizing their potential through higher education. The income from the Scholarship Fund will be awarded annually to a student enrolled in University College or Lincoln College who demonstrates financial need and academic stability and who meets certain other conditions of eligibility.

University and Lincoln College Faculty Society Memorial Scholarship Awards

The Faculty Society of University and Lincoln College, Northeastern University, offers two awards annually, primarily for excellence in studies, to Bachelor degree candidates in University and Lincoln College who have carried, and are currently carrying, a minimum of 24 quarter hours annually. Applications, available during the winter quarter, must be returned before the Spring Quarter.

These awards shall be known as University and Lincoln College Society Club Memorial Scholarship Awards in commemoration of the Club's deceased members.

U.S. Navy Field Training Supervisors Association Memorial Scholarship

A scholarship fund has been established by the generosity of the United States Navy Field Training Supervisors Association, in commemoration of the Association's deceased members. The Scholarship is awarded annually to a deserving student, selected by the Committee on Scholarships, who is a Management major, working toward a Bachelor of Science degree in the evening program of University College.

Roberta Macycove Wasserman Memorial Scholarship

This Scholarship was established in 1976 through the generosity of family members and friends of Roberta Macycove Wasserman who, at the time of her death in 1975, was pursuing Liberal Arts studies within University College. The income from the Memorial Scholarship Fund is awarded annually to a deserving female student who is a homemaker with family responsibilities and who is pursuing part-time studies within University College. The recipient shall demonstrate financial need, soundness of character, and academic stability.

Sigma Epsilon Rho Honor Society Scholarship Award

The Sigma Epsilon Rho Honor Society Scholarship Award, established in 1974 by the membership of the Society, is awarded annually to an undergraduate student of University and/or Lincoln College at Northeastern University. Eligible students must have a cumulative Quality Point Average of 3.0 or better after completing 80 percent or more of their required studies.

Transportation Club of New England Scholarship

The Transportation Club of New England provides approximately eight scholarships annually for persons employed in transportation and industry traffic departments. The scholarships are applicable toward tuition, books, and incidental expenses involved in transportation management courses. The purpose of the plan is to afford a limited number of people an opportunity to expand and improve their education by systematized study in courses in the field of transportation and distribution management. The scholarships are administered cooperatively with the Scholarship Committee of the Transportation Club of New England. Applications may be secured from and filed with the Secretary, Transportation Club of New England, 150 Causeway Street, Boston, Mass., 02114. Each applicant must be sponsored by a member of the Transportation Club.

FINANCIAL AID

The Office of Financial Aid, located in 254 Richards Hall, offers several types of assistance to part-time students. All awards are based on financial need. Aid granted from programs sponsored by the federal government is dependent upon the amount of funding allocated to Northeastern University. The University does not award financial assistance in any form to students who are not citizens or permanent residents of the United States.

Basic Educational Opportunity Grants (BEOG)

The Basic Educational Opportunity Grant program is a federal aid program designed to provide financial assistance to those who need it to attend post-high school educational institutions. Basic Grants are intended to be the "floor" of a financial aid package and may be combined with other

forms of aid in order to meet the full costs of education. BEOG is a grant and, unlike a loan, does not have to be repaid. Half-time students taking at least 6 credit hours each quarter may now apply. Awards range up to one-half the maximum allowable by law contingent upon the total cost of education. Applications are available in the Office of Financial Aid, 254 Richards Hall, or by writing to BEOG, Post Office Box 84, Washington, D.C., 20044.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic workload, are accepted as degree candidates, i.e. have 40 credit hours and a matriculation certificate, and who show evidence of financial need.

Students may borrow as much as \$1,500 each academic year, up to the maximum of \$5,000 for their undergraduate education, or a total of \$10,000 through the completion of graduate studies. Repayment and interest on these loans does not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a ten-year period with the interest at the rate of 3% per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Borrowers who elect to teach the disadvantaged or handicapped may qualify for cancellation of their entire obligation at the rate of 15% per year of teaching service. A borrower serving as a full-time member of the Armed Services of the United States is entitled to cancel 12½% per annum of the principal outstanding on any loans, for each year of such service, up to a maximum cancellation of 50%.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to \$2,000 a year (the law allows a maximum of \$2,500 per year) depending on financial need. The Federal Government pays the interest while the student is in school if the student is eligible for interest subsidy.

Applications for this loan are available from local banks or the Education Office of your state government. Additional information is available from the Financial Aid Office.

Law Enforcement Assistance Administration

The Law Enforcement Assistance Administration, U.S. Department of Justice, has set up an Office of Academic Assistance under authority of the Omnibus Crime Control and Safe Streets Act of 1968, Public Law 90-351. Through the University, loans up to \$2,200 per year for tuition and grants up

to \$250 per academic quarter for tuition and fees are available to law enforcement personnel in undergraduate or graduate programs leading to degrees or certificates in areas directly related to law enforcement.

The loans, limited to full-time students in or preparing for law enforcement or corrections careers, are cancelled at the rate of 25 percent for each year the recipient subsequently serves in law enforcement at the federal, state, or local level.

The grants are available to full-time or part-time students employed in a publicly-funded law enforcement agency, and involve a signed agreement to remain in the service of a law enforcement agency employing such applicant for two years following completion of the course for which aid was given.

Applications for loans or grants should be obtained from the Office of Financial Aid, Room 254 Richards Hall.



student activities

Student activities for part-time students are planned, organized, and operated by the student body with the assistance of the Director of University-Lincoln College Student Activities. The programs are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in University College and Lincoln College are welcome to participate.

The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The Office of University-Lincoln College Student Activities is particularly interested in developing new clubs which will benefit students professionally and educationally. If students wish to start clubs related to their professions, this office will help them plan and organize clubs on the local and national level. The program is dedicated to assisting the adult student in the development of his or her fullest potential. The University-Lincoln College Student Activities Office is located in 102 Churchill Hall.

Purpose

The purposes of part-time student activities are:

To provide opportunities for the development and pursuit of cultural interests and professional objectives.

To encourage the development of leadership activities and skills.

To enable the student to identify more closely with the University.

To include the family, as an important and vital motivating force, in the part-time student's educational career.

Sigma Epsilon Rho Honor Society

Sigma Epsilon Rho is the honor society of University College. Its purposes are:

To promote acquaintance and good fellowship among those students who have attained highest scholastic standing in the College.

To stimulate the student body to higher scholastic accomplishment through the bearing, influence, and work of these selected men and women.

To develop methods of mutual improvement and advancement among members.

To support high moral, professional, and scholastic ideals.

Only honor graduates or seniors with honor standing at the end of the junior year are eligible for admission to the society. Admission is by invitation after nomination by the society.

An outstanding book is awarded each year by Sigma Epsilon Rho Society to the highest-ranking student at the conclusion of the junior year. Students will receive the award only in the event that they enroll for the subsequent year.

Lambda Alpha Epsilon

Lambda Alpha Epsilon is a national law enforcement fraternity founded in 1957. The Northeastern Chapter Kappa Phi Beta is open to part-time and day students enrolled in Law Enforcement, Security and Correctional Practices Programs and to professional men in the fields of law enforcement and security. The fraternity is dedicated to the furtherance of professional standards in law enforcement.

Evening Student Council

The Evening Student Council was formed to provide a representative body to promote the welfare of the student body in non-academic areas and to foster extracurricular activities which will enrich University life. It affords participants opportunities to meet and develop close personal relationships with fellow students and the administrative staff.

The Evening Student Council provides students with opportunities to develop leadership skills and gives them a chance to discuss matters of professional interest with experts in their chosen field.

The Council is made up of interested students in University and Lincoln College, representatives of part-time interest groups, and those specially certified by the Council because of their demonstrated interest in the overall adult programs of the University.

The E.S.C., a member of the United States Association of Evening Students, meets evenings on a monthly basis. Students are welcome to visit, observe, and express opinions concerning part-time student life.

Use of Gymnasium Facilities

Specific schedules for use of the pool, weight training room, indoor athletic field and track, gymnasium, and wrestling room are set up each quarter for use by all part-time students. In order to become eligible, students must obtain a temporary Gymnasium Pass each time they wish to use the Cabot Gymnasium Complex. Passes are available in Cabot Room 111, Monday through Friday from 4:30 p.m. to 9:30 p.m. and on Saturday. Sunday hours will be from 1:00 p.m. to 4:00 p.m. All students requesting a pass must present their Student Identification Card prior to receiving a pass. Students using the Cabot Gymnasium Complex are required to abide by all the Rules of the Gym and may be asked to complete a Medical Release form. Revised schedules for holiday periods will be posted.

Alumni Association

More than 78,000 alumni are members of the all-University Alumni Association which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Alumni Relations office is located in Room 101, Ell Student Center.

The official records and addresses of alumni are maintained in Room 260, United Realty Building.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in Lincoln and University Colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of the undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 50 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the Alumnae Organization and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the five major sports.

One of the most recent developments in alumni activities is the organization of seminars which are conducted by the Association in cooperation with the University's Center for Continuing Education. The seminars are designed particularly for alumni who have a special interest in current events and the field of adult education.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.

Alumni Relations

The Alumni Association is providing a uniquely valuable service to both the University and the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. These meetings, held in cooperation with the Northeastern Department of Admissions, have been extremely well attended. Local residents as well as Alumni of the University have been invited to these conferences which help to clarify many of the questions today's parents and young people have concerning application procedures of colleges and universities.

programs of study

University College conducts part-time educational programs at the undergraduate level during day and evening hours. The programs are designed to help meet the varying needs and interests of adult students who may enroll as (1) *Regular* students following degree programs or as (2) *Special* students taking single courses or special programs.

University College programs leading to the Bachelor of Science and Bachelor of Arts degrees help provide opportunities for cultural and professional development equivalent in quality and scope to those offered in the conventional four-year college enrolling full-time students. The bachelor's degree requires 174 quarter hours of credit.

Programs leading to the Associate in Science degree help provide students with a background in fundamental areas in business administration, liberal arts, law enforcement, health professions, and therapeutic recreation services. The Associate degree requires 96 quarter hours of credit and is equivalent to the conventional two-year or junior college in scope and quality.

Degree curricula are offered in the following areas:

BUSINESS ADMINISTRATION

Major	Degree	Page
Business Administration	Associate in Science	55
Electronic Data Processing	Associate in Science	56
Purchasing	Associate in Science	57
Real Estate	Associate in Science	58
Transportation and Physical Distribution	Associate in Science	59
Accounting	Bachelor of Science	60
Finance	Bachelor of Science	61
Industrial Management	Bachelor of Science	62
Industrial Technology	Bachelor of Science	64
Insurance	Bachelor of Science	65
Management	Bachelor of Science	66
Management Information Systems	Bachelor of Science	67
Marketing	Bachelor of Science	68
Personnel and Industrial Relations	Bachelor of Science	69
Transportation and Physical Distribution Management	Bachelor of Science	70
Combined Program in Liberal Arts and Management	Bachelor of Science	71

LIBERAL ARTS

Major	Degree	Page
Economics	Bachelor of Arts	78
	Bachelor of Science	79
English	Bachelor of Arts	80
	Bachelor of Science	81
Fine Arts	Bachelor of Arts	82
	Bachelor of Science	82
History	Bachelor of Arts	84
	Bachelor of Science	85
Liberal Arts	Associate in Science	86
Music	Bachelor of Arts	95
	Bachelor of Science	95
Political Science	Bachelor of Arts	87
	Bachelor of Science	87
Psychology	Bachelor of Arts	90
	Bachelor of Science	90
Sociology-Anthropology	Bachelor of Arts	92
	Bachelor of Science	94
Chemical-Biological Technology	Associate in Science	97
	Bachelor of Science	98

LAW ENFORCEMENT

Major	Degree	Page
Correctional Practices	Bachelor of Science	104
	Associate in Science	106
Law Enforcement	Bachelor of Science	108
	Associate in Science	110
Security	Bachelor of Science	112
	Associate in Science	114

HEALTH PROFESSIONS PROGRAMS

Major	Degree	Page
Health Science	Bachelor of Science	118
Health Management	Bachelor of Science	120
Long Term Care Admin.	Option in Health Management	121
Health/Medical Record Administration	Bachelor of Science	123
	Certificate	124
Medical Laboratory Sciences		
Medical Technology	Associate in Science	126
	Bachelor of Science	127
Hematology	Bachelor of Science	128
Cytotechnology	Associate in Science	131
	Certificate	132
Radiologic Technology	Associate in Science	134
	Certificate	133

EDUCATION

Major	Degree	Page
Teaching of English (in grades 7 - 12)	Bachelor of Science	138

THERAPEUTIC RECREATION SERVICES

Major	Degree	Page
Therapeutic Recreation Services	Certificate	141
	Associate in Science	143

Course descriptions are listed in numerical order by department beginning on page 144.



business administration

Paul D. Maxwell, Associate Dean •
Director, Business Administration Programs
Telephone 437-2418

Aims

Business Administration programs of study are offered to help meet the needs of adult men and women wishing to acquire a college education on a part-time basis. The opportunity to achieve professional competence in a chosen field, while developing potential for further managerial growth, is one of the program's principal objectives. Degree programs are designed to create both a breadth of perspective and a degree of specialization. Breadth of perspective may be obtained through exposure to a well-balanced sequence of liberal arts courses, which emphasize fundamental economic laws and the social and cultural foundations of our changing American society. Specialized knowledge for future managerial growth may be acquired through the study of basic business courses, in addition to a self-determined study of a major business area.

Requirements

Associate in Science Degree

The Associate in Science degree is offered in the following fields of study: Business Administration, Electronic Data Processing, Purchasing, Real Estate, and Transportation and Physical Distribution Management. To qualify for the associate degree 96 quarter hours must be successfully completed in one of the five associate programs. Detailed information on these programs, together with a recommended sequence for completing them, appears on the following pages.

New Students—Please Note:

In an effort to achieve a certain level of analytic and academic sophistication among students taking upper-level business administration courses (designated by an asterisk wherever they appear in the catalog), University College instituted a new procedure in the Fall Quarter of 1969 whereby all new students are required to successfully complete an appropriate associate degree program before becoming eligible to take upper-level business administration courses. Special students (students not pursuing a degree program) may take upper-level courses if they can demonstrate to a

program adviser (always present during registration) or to one of the deans in University College that they have an adequate background to cope with upper-level course content. In determining whether a student has “an adequate background,” the program advisers and the deans will evaluate, but not be limited to, such factors as work experience, former college work, independent study, etc.

The “appropriate” program for all Bachelor degree students, except Management Information Systems and Transportation and Physical Distribution Management degree students, is the associate degree program in Business Administration.

The “appropriate” program for the MIS degree student is the associate degree program in Electronic Data Processing (EDP); the associate degree program in Transportation and Physical Distribution Management is the associate degree program of the same title.

Students pursuing one of the other associate programs or students pursuing an “inappropriate” associate program may make special arrangements with the Dean of Administration and the Director of Business Programs for a bachelor’s program.

A student with a 2.0 average or better in an associate degree program will be considered by University College as having “successfully completed” the program. It should be noted that students do not have to formally *receive* Associate degrees; successful completion of the associate degree program (or demonstration of an “adequate background” in the case of special students) is all that is necessary for entry into upper-level business administration courses.

The Bachelor of Science Degree

The Bachelor of Science degree in Business Administration is offered in the following fields of study: Accounting, Finance, Industrial Management, Industrial Technology, Insurance, Management, Management Information Systems, Marketing, Personnel and Industrial Relations, Transportation and Physical Distribution Management, and in the Combined Program in Liberal Arts and Management.

English Requirements

English requirements shall be completed by taking either English I, II, III or already having received credit for a minimum of 9 quarter hours of English credits. Students should contact the Director of Academic and Student Services, 437-2400, to ensure their status regarding the fulfillment of this requirement.

Single Quarter Intensives

Many courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

BUSINESS ADMINISTRATION**Associate in Science Degree**

Basic Courses—Liberal Arts			quarter hours	
10.527,	10.528,	10.529	Mathematics I, II, III	9
19.301,	19.302,	19.303	Psychology I, II, III	9
30.305,	30.306,	30.307	English I, II, III	9
39.301,	39.302,	39.303	Economic Principles & Problems I, II, III	9
39.311,	39.312,	39.313	Statistics I, II, III	9
				45
				—
Applied Courses				
49.310,	49.311	Electronic Data Processing I, II	6	
	49.320	COBOL for Non-Programmers	3	
49.400,	49.401	Human Relations I, II	6	
49.420,	49.421	Labor Relations I, II	6	21
				—
Basic Courses—Business Administration				
41.301,	41.302	Accounting Principles I, II	6	
	43.301	Introduction to Marketing I	3	
	44.301	Introduction to Finance	3	
	45.301	Management & Organization I	3	
	45.400	Production Management and Manufacturing Systems I	3	18
				—
Electives				12
				—
Total Credits				96

Students following a degree program should refer to the suggested course sequence which follows.

**Recommended Course Sequence for the 3-year Program
Leading to the Associate in Science Degree**

	Quarter I	Quarter II	Quarter III
1st Year	English I Accounting I Human Rel. I Mgmt. & Org. I	English II Accounting II Human Rel. II Elective	English III Elective Elective Intro. to Finance
2nd Year	Economics I Math I EDP I Elective	Economics II Math II EDP II Elective	Economics III Math III COBOL Prod. Mgmt. I
3rd Year	Psychology I Statistics I Intro. to Mktng. I	Psychology II Statistics II Labor Rels. I	Psychology III Statistics III Labor Rels. II

ELECTRONIC DATA PROCESSING

Associate in Science Degree

Basic Courses—Liberal Arts				quarter hours	
10.527,	10.528,	10.529	Mathematics I, II, III	9	
	29.301,	29.302	Effective Speaking I, II	6	
39.301,	39.302,	39.303	Economic Principles & Problems I, II, III	9	
30.305,	30.306,	30.307	English I, II, III	9	
39.311,	39.312,	39.313	Statistics I, II, III	9	42
				—	
Applied Courses					
	10.532,	10.533	Mathematics for Business I, II	6	
		45.306	Project Planning & Control	3	
	49.310,	49.311	Electronic Data Processing I, II	6	
49.321,	49.322,	49.323	COBOL Programming I, II, III	9	24
				—	
Major Concentration Courses					
	41.301,	41.302	Accounting Principles I, II	6	
	45.301,	45.302	Management and Organization I, II	6	
49.360,	49.361,	49.362	Systems Analysis and Design I, II, III	9	21
				—	
Electives					9
				—	
Total Credits					96

Additional departmental offerings appear on pages 238 through 243.

Recommended Course Sequence for the 3-year Program

Leading to the Associate in Science Degree

	Quarter I	Quarter II	Quarter III
1st Year	English I Accounting I Mgmt. & Org. I EDP I	English II Accounting II Mgmt. & Org. II EDP II	English III Elective Elective Proj. Planning
2nd Year	Economics I Math I Sys. Analysis I COBOL I	Economics II Math II Sys. Analysis II COBOL II	Economics III Math III Sys. Analysis III COBOL III
3rd Year	Effective Spking. I Statistics I Math. for Bus. I	Effective Spking. II Statistics II Math. for Bus. II	Elective Statistics III Elective

PURCHASING**Associate in Science Degree****Basic Courses—Liberal Arts****quarter hours**

10.527, 10.528, 10.529	Mathematics I, II, III	9	
30.305, 30.306, 30.307	English I, II, III	9	
39.301, 39.302, 39.303	Economic Principles & Problems I, II, III	9	
39.311, 39.312, 39.313	Statistics I, II, III	9	36

Applied Courses

49.310, 49.311	Electronic Data Processing I, II	6	
49.400, 49.401	Human Relations I, II	6	12

Basic Courses—Business Administration

41.301, 41.302	Accounting Principles I, II	6	
43.301	Introduction to Marketing I	3	
44.301	Introduction to Finance	3	
45.301	Management & Organization I	3	
45.400	Production Management & Manufacturing Systems I	3	18

Major Field of Study

45.410	Production Control & Inventory Management	3	
45.414	Materials Management	3	
45.451, 45.452	Purchasing I, II	6	
45.456	Administration of Purchasing Contracts	3	
45.457	Art & Technique of Purchasing Negotiations	3	
45.458	Materials Requirement Planning	3	
49.385	Principles of Materials Inspection	3	24

Electives**6****Total Credits****96**

Additional departmental offerings appear on pages 233 through 234.

**Recommended Course Sequence for the 3-year Program
Leading to the Associate in Science Degree**

	Quarter I	Quarter II	Quarter III
1st Year	English I Math I Accounting I Mgmt. & Org. I	English II Math II Accounting II Prod. Mgmt. I	English III Math III Intro. to Mktng. I Intro. to Finance
2nd Year	Economics I Purchasing I Human Rel. I EDP I	Economics II Purchasing II Human Rel. II EDP II	Economics III Mat'l's Req. Plan Elective Matls. Mgmt.
3rd Year	Statistics I Adm. of Purch. Control Prod. Control	Statistics II Purch. Negtns. Matls. Irsp.	Statistics III Elective Elective

REAL ESTATE

Associate in Science Degree

Basic Courses—Liberal Arts				quarter hours	
10.527,	10.528,	10.529	Mathematics I, II, III	9	
30.305,	30.306,	30.307	English I, II, III	9	
39.301,	39.302,	39.303	Economic Principles & Problems I, II, III	9	
39.311,	39.312,	39.313	Statistics I, II, III	9	36
				—	
Applied Courses					
	49.301,	49.302	Law I, II	6	
	49.400,	49.401	Human Relations I, II	6	12
				—	
Basic Courses—Business Administration					
	41.301,	41.302	Accounting Principles I, II	6	
		44.301	Introduction to Finance	3	
		45.301	Management & Organization I	3	12
				—	
Major Concentration Courses					
	47.320,	47.321	Real Estate Fundamentals I, II	6	
47.323,	47.324,	47.325	Real Estate Appraisal I, II, III	9	
	47.328	47.329	Real Estate Financial Analysis I, II	6	
			Departmental Offerings	9	30
				—	
Electives					6
					—
Total Credits					96

Additional departmental offerings appear on pages 234 through 236.

Recommended Course Sequence for the 3-Year Program
Leading to the Associate in Science Degree

	Quarter I	Quarter II	Quarter III
1st Year	English I Math I Accounting I R.E. Funds. I	English II Math II Accounting II R.E. Funds. II	English III Math III Mgmt. & Org. I R.E. Title Exam
2nd Year	Economics I Human Rel. I R.E. Appr. I Law I	Economics II Human Rel. II R.E. Appr. II Law II	Economics III Intro. to Fin. R.E. Appr. III Elective
3rd Year	Statistics I R.E. Anal. I Elective	Statistics II R.E. Anal. II Elective	Statistics III R.E. Development Elective

TRANSPORTATION AND PHYSICAL DISTRIBUTION MANAGEMENT**Associate in Science Degree****Basic Courses—Liberal Arts**

				quarter hours	
10.527,	10.528,	10.529	Mathematics I, II, III	9	
30.305,	30.306,	30.307	English I, II, III	9	
39.301,	39.302,	39.303	Economic Principles & Problems I, II, III	9	
39.311,	39.312,	39.313	Statistics I, II, III	9	36
				—	

Applied Courses

49.400,	49.401	Human Relations I, II	6	
49.420,	49.421	Labor Relations I, II	6	12

Basic Courses—Business Administration

41.301,	41.302	Accounting Principles I, II	6	
	43.301	Introduction to Marketing I	3	
	44.301	Introduction to Finance	3	
45.301,	45.302	Management & Organization I, II	6	18

Major Concentration Courses

	48.301	Elements of Transportation	3	
	48.302	Physical Distribution Management	3	
48.305,	48.306	Traffic Management I, II	6	
	48.307	Contemporary Issues in Transportation & Distribution	3	
48.308,	48.309	Transportation Regulation & Promotion I, II	6	
	48.316	Carrier Management	3	24

Electives**6****Total Credits****96**

Additional departmental offerings appear on pages 236 through 237.

**Recommended Course Sequence for the 3-year Program
Leading to the Associate in Science Degree**

	Quarter I	Quarter II	Quarter III
1st Year	English I Math I Accounting I Mgmt. & Org. I	English II Math II Accounting II Mgmt. & Org. II	English III Math III Intro. to Mkting. I Elms. of Transportation
2nd Year	Economics I Human Relations I Physical Dist. Mgmt. Reg. & Prom. I	Economics II Human Relations II Labor Rels. I Reg. & Prom. II	Economics III Intro. to Finance Labor Rels. II Elective
3rd Year	Statistics I Traffic Mgmt. I Carrier Mgmt.	Statistics II Traffic Mgmt. II Elective	Statistics III Contemporary Issues Elective

ACCOUNTING

Bachelor of Science Degree

				quarter hours	
Associate Degree Program					96
Core Courses—Liberal Arts					
21.301,	21.302,	21.303	Sociology I, II, III	9	
		29.301	Effective Speaking I	3	12
				—	
Applied Courses					
	49.301,	49.302	Law I, II*	6	6
				—	
Major Concentration Courses					
41.401,	41.402,	41.403	Intermediate Accounting I, II, III*	9	
	41.405,	41.406	Cost Accounting I, II*	6	
		41.407	Advanced Accounting I*	3	
	41.410,	41.411	Seminar in Contemporary Problems I, II*	6	24
				—	
Electives					36
					—
Total Credits					174

Additional departmental offerings appear on pages 218 through 220.

*Upper level course - see page 53.

FINANCE**Bachelor of Science Degree**

				quarter hours	
Associate Degree Program					96
Core Courses—Liberal Arts					
21.301,	21.302,	21.303	Sociology I, II, III	9	
	29.301,	29.302	Effective Speaking I, II	6	
		30.311	Business Writing & Reports I	3	18
				—	
Applied Courses					
	49.301,	49.302	Law I, II	6	6
				—	
Major Concentration Courses					
	*44.310,	*44.311	Financial Management I, II	6	
	*44.312,	*44.313	Investments I, II	6	
			Departmental Offerings	12	24
				—	
Electives					30
					—
Total Credits					174

Specialization track recommendations:**Corporate Financial Management**

*44.314,	*44.315	Credit Management I, II	6	
*44.316,	*44.317	Profit Planning & Control I, II	6	
	*44.320	Advanced Financial Management	3	
	*44.323	Seminar in Finance	3	
*44.328,	*44.329	International Finance I, II	6	
			—	
			24	

Investment Management

*44.318,	*44.319	Management of Financial Institutions I, II	6	
	*44.320	Advanced Financial Management	3	
	*44.322	Advanced Investment Management	3	
	*44.324	Seminar in Investments	3	
*44.325,	*44.326	Personal Financial Management I, II	6	
			—	
			21	

Management of Financial Institutions

*44.318,	*44.319	Management of Financial Institutions I, II	6	
*44.314,	*44.315	Credit Management I, II	6	
	*44.322	Advanced Investment Management	3	
	*44.324	Seminar in Investments	3	
*44.325,	*44.326	Personal Financial Management	6	
			—	
			24	

Departmental offerings appear on pages 224 through 227.

*Upper level course—see page 53.

INDUSTRIAL MANAGEMENT

Bachelor of Science Degree

				quarter hours	
Associate Degree Program					96
Core Courses—Liberal Arts					
10.532,	10.533	Math for Business I, II		6	
	16.311	History of Ancient World Sciences and Technologies		3	
	16.312	History of Modern World Sciences and Technologies		3	
19.332,	19.333	Industrial Psychology I, II		6	
29.301,	29.302	Effective Speaking I, II		6	
30.311,	30.312	Business Writing & Reports I, II		6	30
				—	
Applied Courses					
	45.315	Effecting Change		3	
49.301,	49.302	Law I, II		6	9
				—	
Major Concentration Courses—Students specializing in Quality Control Management					
	45.403	Manufacturing Processes*		3	
	45.404	Value Management*		3	
45.411,	45.412	Industrial Decision Making I, II*		6	
	45.413	Manufacturing Seminar*		3	
	49.382	Statistical Quality Control*		3	
	49.383	Management of Quality Control*		3	
	49.385	Material Inspection*		3	24
				—	
Electives					15
				—	
Total Credits					174
Major Concentration Courses—Students specializing in Operations Management					
	45.403	Manufacturing Processes*		3	
	45.404	Value Management*		3	
	45.405	Industrial Safety*		3	
	45.406	Methods Analysis, Time and Motion Study*		3	
	45.407	Operations Management*		3	
45.411,	45.412	Industrial Decision Making I, II*		6	
	45.413	Manufacturing Seminar*		3	24
				—	
Electives					15
				—	
Total Credits					174

*Upper level course—see page 53.

Major Concentration Courses—Students specializing in Materials Management

	45.404	Value Management*	3	
	45.410	Production Control & Inventory Management	3	
45.411,	45.412	Industrial Decision Making I, II*	6	
	45.413	Manufacturing Seminar*	3	
	45.414	Materials Management	3	
45.451,	45.452	Purchasing I, II	6	24
			—	
Electives				15
				—
		Total Credits		174

Major Concentration Courses—Students specializing in Manufacturing Administration

	41.307	Accounting for Management Decisions*	3	
	45.306	Project Planning & Control*	3	
	45.403	Manufacturing Processes*	3	
	45.406	Methods Analysis, Time & Motion Study*	3	
45.411,	45.412	Industrial Decision Making I, II*	6	
	45.413	Manufacturing Seminar*	3	
49.360,	49.361	Systems Analysis & Design I	3	24
			—	
Electives				15
				—
		Total Credits		174

Additional departmental offerings appear on pages 230 through 232.

*Upper level course—see page 53.

INDUSTRIAL TECHNOLOGY

Bachelor of Science Degree

				quarter hours	
Engineering or Science Technology Courses					96**
Core Courses—Liberal Arts					
19.301,	19.302,	19.303	Psychology I, II, III	9	
21.301,	21.302,	21.303	Sociology I, II, III	9	
39.301,	39.302,	39.303	Economic Principles & Problems I, II, III	9	27
				—	
Applied Courses					
	49.301,	49.302	Law I, II*	6	
		49.310	Electronic Data Processing I	3	
	49.400,	49.401	Human Relations I, II	6	
	49.420,	49.421	Labor Relations I, II	6	21
				—	
Core Courses—Business Administration					
	41.301,	41.302	Accounting Principles I, II	6	
		43.301	Introduction to Marketing I	3	
	45.301,	45.302	Management & Organization I, II	6	
		45.403	Manufacturing Processes	3	
		49.382	Statistical Quality Control	3	
		49.383	Management of Quality Control	3	24
				—	
Electives					6
				—	
Total Credits					174

*Upper level course—see page 53.

**Must have completed English I, II, III or its equivalent.

INSURANCE**Bachelor of Science Degree**

				quarter hours	
Associate Degree Program					96
Core Courses—Liberal Arts					
21.301,	21.302,	21.303	Sociology I, II, III	9	
	29.301,	29.302	Effective Speaking I, II	6	
		30.311	Business Writing & Reports I	3	18
				—	
Applied Courses					
	49.301,	49.302	Law I, II*	6	6
				—	
Major Concentration Courses					
		44.401	Insurance	3	
			Departmental Offerings	21	24
				—	
Electives					30
					—
Total Credits					174

Additional Departmental offerings appear on pages 227 through 228.

*Upper level course—see page 53.

MANAGEMENT

Bachelor of Science Degree

				quarter hours	
Associate Degree Program					96
Core Courses—Liberal Arts					
19.332,	19.333	Industrial Psychology I, II	6		
29.301,	29.302	Effective Speaking I, II	6		
30.311,	30.312	Business Writing & Reports I, II	6		
39.331,	39.332, 39.333	Business Cycles I, II, III	9	27	
				—	
Applied Courses					
	45.306	Project Planning & Control	3		
49.301,	49.302	Law I, II*	6	9	
				—	
Major Concentration Courses					
	41.307	Accounting for Management Decisions*	3		
	43.334	Marketing Management I*	3		
	44.318	Management of Financial Institutions I*	3		
	45.303	Principles & Practices of Management	3		
45.310,	45.311	Management Decisions and Policies I, II*	6		
45.313,	45.314	Management Seminar I, II*	6	24	
				—	
Electives					18
					—
Total Credits					174

Additional departmental offerings appear on pages 228 through 230.

*Upper level course—see page 53.

MANAGEMENT INFORMATION SYSTEMS Bachelor of Science Degree

				quarter hours	
Associate Degree Program					96
Core Courses—Liberal Arts					
21.301,	21.302,	21.303	Sociology I, II, III	9	
	30.311,	30.312	Business Writing & Reports I, II	6	15
				—	
Applied Courses					
	49.301,	49.302	Law I, II*	6	
		49.380	Introduction to Operations Research*	3	
		49.381	Operations Research Applications*	3	
	49.400,	49.401	Human Relations I, II	6	
	49.420,	49.421	Labor Relations I, II	6	24
				—	
Major Concentration Courses					
		44.301	Introduction to Finance	3	
		44.310	Corporate Finance I	3	
		49.363	Systems Analysis & Design IV*	3	
		49.364	Data Systems Administration	3	
		49.365	Data Processing Applications I	3	
	49.367,	49.368	Senior Seminar I, II*	6	21
				—	
Electives					18
					—
Total Credits					174

Additional departmental offerings appear on pages 238 through 243.

*Upper level course—see page 53.

MARKETING

Bachelor of Science Degree

				quarter hours	
Associate Degree Program					96
Core Courses—Liberal Arts					
21.301,	21.302,	21.303	Sociology I, II, III	9	
	29.301,	29.302	Effective Speaking I, II	6	
	30.311,	30.312	Business Writing & Reports I, II	6	21
				—	
Applied Courses					
	49.301,	49.302	Law I, II*	6	6
				—	
Major Concentration Courses					
	43.302		Intro. to Marketing II	3	
	43.334,	43.335	Marketing Management I, II*	6	
	43.313,	43.314	Marketing Research I, II*	6	
	43.322,	43.323	Sales Management I, II*	6	21
				—	
Electives					30
					—
Total Credits					174

Additional departmental offerings appear on pages 221 through 224.

*Upper level course—see page 53.

PERSONNEL AND INDUSTRIAL RELATIONS**Bachelor of Science Degree**

				quarter hours	
Associate Degree Program					96
Core Courses—Liberal Arts					
21.301,	21.302,	21.303	Sociology I, II, III	9	
26.301,	26.302,	26.303	Introduction to Philosophy I, II, III	9	
	29.301,	29.302	Effective Speaking I, II	6	24
				—	
Applied Courses					
	49.301,	49.302	Law I, II*	6	6
				—	
Major Concentration Courses					
49.404,	49.405,	49.406	Personnel Management I, II, III*	9	
49.423,	49.424,	49.425	Legal Standards for the Workplace I, II, III*	9	
	49.426,	49.427	New Patterns of Collective Bargaining I, II*	6	24
				—	
Electives					24
					—
Total Credits					174

Additional departmental offerings appear on pages 244 through 246.

*Upper level course—see page 53.

**TRANSPORTATION AND PHYSICAL
DISTRIBUTION MANAGEMENT**
Bachelor of Science Degree

				quarter hours	
Associate Degree Program					96
Core Courses—Liberal Arts					
19.301,	19.302,	19.303	Psychology I, II, III	9	
			or		
21.301,	21.302,	21.303	Sociology I, II, III	9	
	29.301,	29.302	Effective Speaking I, II	6	
39.323,	39.324,	39.326	Government & Business I, II, III	9	24
				—	
Applied Courses					
	49.301,	49.302	Law I, II*	6	
	49.310,	49.311	Electronic Data Processing I, II	6	
		49.320	COBOL for Non-Programmers	3	15
				—	
Electives					39
					—
Total Credits					174

Additional departmental offerings appear on pages 236 through 237.

*Upper level course—see page 53.

COMBINED PROGRAM IN LIBERAL ARTS AND MANAGEMENT**Bachelor of Science Degree**

				quarter hours	
Basic Courses—Liberal Arts					
10.527,	10.528,	10.529	Mathematics I, II, III	9	
19.301,	19.302,	19.303	Psychology I, II, III	9	
30.305,	30.306,	30.307	English I, II, III	9	
39.301,	39.302,	39.303	Economic Principles & Problems I, II, III	9	36
				—	
Core Courses—Liberal Arts					
21.301,	21.302,	21.303	Sociology I, II, III	9	
22.301,	22.302,	22.303	Principles of Political Science I, II, III	9	
23.301,	23.302,	23.303	History of Civilization I, II, III	9	
23.304,	23.305,	23.306	American History I, II, III	9	
26.301,	26.302,	26.303	Introduction to Philosophy I, II, III	9	
39.311,	39.312,	39.313	Statistics I, II, III	9	54
				—	
Liberal Arts Electives					
			Fine Arts: Art, Music, or Theatre Arts	9	
			Literature: English, American, or other in translation	9	18
				—	
Applied Courses					
49.301,	49.302	Law I, II*	6		
49.310,	49.311	Electronic Data Processing I, II	6		
	49.320	COBOL for Non-Programmers	3		
49.400,	49.401	Human Relations I, II	6		
49.420,	49.421	Labor Relations I, II	6	27	
				—	
Core Courses—Business Administration					
41.301,	41.302	Accounting Principles I, II	6		
	43.301	Introduction to Marketing I	3		
	44.301	Introduction to Finance	3		
44.310,	44.311	Corporate Finance I, II*	6		
45.301,	45.302	Management & Organization I, II	6	24	
				—	
Electives					15
					—
Total Credits					174

*Upper level course—see page 53.

liberal arts

Dr. Harold Naidus, Associate Dean
Director, Liberal Arts Programs
Telephone 437-2416

Aims

In providing the means to a modern liberal education, University College has the main objective of stimulating and guiding the self-development of the student in three main areas: first, intellectual growth; second, the development of character and sense of values; and third, preparation for, or advancement in, a career.

Intellectual growth — the development of the ability to think independently and creatively—rests upon the foundation of a sound general education. Through the liberal arts curricula, students are guided toward an appreciative understanding of the active discovery of ideas and methods in the areas of humanities, natural science, and social science. With this training, the student can more fully realize the basic values upon which civilization rests and can more fully participate in the intellectual, moral, and material achievement of that civilization.

Through its many programs, University College tries to provide experiences conducive to the development of strength of character and a sense of personal responsibility, including such personal qualities as self-reliance, integrity, perseverance, and the ability to work with others.

University College holds that there is no inconsistency between a truly liberal education and preparation for a vocation. As an adventure in intellectual discovery, a liberal education leads to the broadening and intensification of interests as the student becomes aware of his or her own mental strengths and weaknesses. This discovery is essential for making more intelligent and realistic appraisals of self and career. A career brings meaning and focus to the educational experience. Education presents both a challenge to accept responsibility and an opportunity to seek knowledge and skills.

Course Number Changes

In the fall of 1977, University College changed from a two-credit curriculum to a three-credit curriculum; consequently, course numbers have been changed.

During the changeover to new course numbers, the course numbers which were previously 00.500 have generally been changed to 00.300 and those which were 00.600 have generally been changed to 00.400. For example, former course 19.501 now becomes 19.301; former course 22.602 now becomes 22.402.

There are several major exceptions. In Biology and Chemistry courses, the change is from 00.500 to 00.400, thus former course 18.511 now becomes 18.411.

For exceptions relating to certain lower-numbered English courses, refer to p. 201.

Methods

To enable each student to plan a college program in keeping with his or her own interests and aptitudes, a wide range of electives is offered. This does not mean that students are free to elect courses indiscriminately, for if they are to obtain a liberal education they must have training in several basic fields.

Therefore, the Curriculum Committee of University College has established basic minimum requirements in each of several fields. These distribution requirements are outlined with each of the program offerings.

Bachelors Degrees

Upon petitioning for matriculation, students must indicate their choice of degree program, Bachelor of Arts or Bachelor of Science.

Bachelor of Arts

Major fields of study are offered in Economics, English, Art, Political Science, History, Psychology, Sociology-Anthropology, and Music. Students should choose their major field of study and their electives in consultation with a program adviser.

The distribution requirements, including specific required courses, are shown with each curriculum.

Each curriculum normally provides for not less than 174 quarter hours of work, including at least 40 quarter hours of advanced work in a major field, and a number of elective liberal arts courses.

All candidates for the Bachelor of Arts degree must have satisfactorily completed in college one full year of a modern language beyond the elementary level and 9 quarter hours of English.

No student transferring from another college or university is eligible to receive a degree until at least 45-46 quarter hours of academic work have been completed at Northeastern University immediately preceding graduation.

Bachelor of Science

Some departments have elected to offer a B.S. degree, the requirements for which are listed after the B.A. degree in the following pages (unless otherwise stated, the requirements are the same as for the B.A. degree).

Chemical-Biological Technology Programs

Recognizing the need for technicians and technologists in modern society, University College offers the following programs (formerly in Lincoln College):

Chemical-Biological Technology (A.S.)	page 97.
Chemical-Biological Technology (B.S.)	page 98.

The Associate in Science Degree

The program leading to the Associate degree is offered for those desiring a general cultural background in the liberal arts and humanities, but who do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree in Liberal Arts must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements (174 quarter hours) for the Bachelor of Science degree.

To provide a balanced program which will achieve the established objectives, the faculty has set a minimum credit requirement in the several areas of study as listed under each major.

Distribution Requirements

For the purpose of satisfying the distribution requirements in all Liberal Arts Majors:

Math-Science includes only courses in Mathematics (10. . . .), Physics (11. . . .), Chemistry (12. . . .), Earth Science (16. . . .), Biology (18. . . .), and Psychology (lab. courses only) (19. . . .).

Humanities includes only courses in Art (27. . . .), Speech and Theatre Arts (29. . . .), English (except *required*) (30. . . .), Journalism (38. . . .), Modern Languages (except required elementary or conversational) (31. . . . to 34. . . .), Philosophy (26. . . .), and Music (28. . . .).

Social Sciences includes only courses in Economics (39. . . .), History (23. . . .), Political Science (22. . . .), Psychology (except laboratory courses) (19. . . .), Social Welfare (25. . . .), and Sociology-Anthropology (20. . . .and 21. . . .).

English Requirement

The 9 quarter hours of *required* English* must be taken prior to matriculation. These are required courses which cannot be used to satisfy distribution requirements in any liberal arts course of study.

30.305, 30.306, 30.307 English I, II, III

9 q.h.

*For new English requirements see explanation on p. 201.

Honors Program

An upperclass honors program is provided in University College to enable superior students to develop their potential to the highest degree by making it possible for them to pursue studies in their major fields to greater depth than is possible in the regular courses.

The nature of the program is determined by the academic department concerned. Programs may involve any of the following elements: special research projects culminating in honor theses, seminars, reading projects, directed independent study, or creative work. Flexibility is the keynote, with every consideration given to the individual needs and requirements of the student. Honors Advisers are chosen from the full-time faculty of the department concerned in consultation with the department Consultant.

Students who have earned 96 quarter hours of credit toward their Bachelor's degree and who have a grade-point average of 3.0 or better are eligible to apply to the Director of Liberal Arts in University College for admission to the program. Acceptance as an honors candidate rests with the academic department concerned.

Acceptance of Credits by the College of Liberal Arts*

The College of Liberal Arts permits its students to enroll for credit in all courses in University College offered on a quarterly basis, when they are pertinent to the student's program and have been approved by the Dean of the College of Liberal Arts. The credits for such courses may be applied:

1. To the total number of credits needed for graduation.
2. To satisfy distribution requirements.
3. To fulfill language and major deficiencies.

Credits from University College, as well as those from other accredited institutions, may not be applied to the quality point average of students in the College of Liberal Arts except when such credits are from courses taken as substitutes for those College of Liberal Arts courses failed by students. In such instances, students must receive a grade of C or better in the University College courses and then only 2.0 quality points are applied to the student's record for each course. Courses taken in University College which are not offered in the Liberal Arts College may be transferred with the full grade upon approval of the major department.

Advanced Standing Credit—Credit for Non-Collegiate Experience (NCE)

A matriculated Liberal Arts student with a departmental major in University College is eligible to obtain up to 16 quarter hours of credit toward either Bachelor's degree (excluding CLEP credit) for knowledge acquired in a non-traditional manner.

*One of the Basic (day) Colleges of Northeastern University.

The student will petition his or her major adviser (with a copy to the Director of Academic and Student Services) for such credit, listing the Liberal Arts course(s), as well as the reasons, for which credit should be received. Under especially unusual circumstances, as interpreted by the petitioned department, the student may also secure credit for subject matter which has no counterpart course in University College. The major adviser will contact the consultant of the appropriate Liberal Arts department to arrange for an appraisal of the student's credentials. At the discretion of the department, this appraisal may or may not include a formal examination. Upon receipt of the consultant's positive or negative recommendation, the student may request the Director of Academic and Student Services to inform him or her in writing of the status of the petition.

In order to plan their last year and to expedite the evaluation of their petition for NCE credit, students planning to graduate during a particular year are urged to submit petitions prior to June 1 of the year preceding graduation. No petitions can be considered after February 1 for June graduation or after March 1 for September graduation.

In no case will this credit be considered as partial fulfillment of the residence requirement nor will a grade be assigned.

No credit will be assigned in this manner for courses which can be accredited through the CLEP testing program at the time of the petition.

Wherever possible, credit will be assigned for specific courses.

It is possible that this credit may be applicable toward a degree in University College only.

Field Work Courses

To provide the opportunity for students to apply their academic background to practical problems, several departments have introduced courses in their curriculum entitled "Field Work In. . . ."

A field work course shall have the following characteristics (as voted by the Curriculum Committee):

1. It shall be a one-quarter course worth six quarter hours of credit.
2. Only matriculated majors within the department offering the course may register.
3. The prerequisites shall be departmentally established.
4. Each student shall make his or her own arrangements for carrying on suitable field work at a departmentally acceptable organization involving departmentally acceptable field work experience(s). The department will participate in student placement only in an advisory capacity.
5. Each student shall spend a minimum of fifteen hours per week at the outside organization on a volunteer or paid basis.
6. Each student shall meet with the departmental field work adviser as frequently as the adviser feels necessary but, in any case, no fewer than three times per quarter (once to formulate the program of field

work experience, once to discuss ongoing work, and once to transmit and discuss the final written report).

7. The student's grade shall be dependent upon both the quality of the experience as demonstrated in the final report and the discussions between the U.C. field work adviser and the outside supervisor.
8. Provided that one student registers, the course will not be cancelled.
9. The outside supervisor will be offered a transferrable voucher for a tuition-free course at Northeastern University.

Prior to registration, each student should consult with the major department.

All field work courses will be numbered as follows:—.499.



ECONOMICS**Bachelor of Arts Degree**

Distribution Requirements (see page 74 for courses included in the three categories listed below:)

	quarter hours	
Math-Science	18	
Humanities	24	
Social Sciences	None	42
	—	

Liberal Arts Program Requirements

*30.305, 30.306, 30.307	English I, II, III	9	
Modern Language:	Elementary or Conversational	12	
	Intermediate	12	33
		—	

Major Concentration Courses—required

39.311, 39.312, 39.313	Statistics I, II, III	9	
39.317, 39.318	Money and Banking I, II	6	
39.319	Government Finance	3	
39.327	Labor Economics	3	
			21
		—	

The remaining 27 hours must be taken from the following advanced courses:

39.321, 39.322	Economic Growth and Development I, II	6	
39.323, 39.324, 39.325	Government and Business I, II, III	9	
	American Economic History	3	
39.328, 39.329	International Economics I, II	6	
39.331, 39.332, 39.333	Business Cycles I, II, III	9	
39.336, 39.337, 39.338	Advanced Statistics I, II, III	9	
	Managerial Economics	3	
	Medical Economics	3	
	Economics of Crime	3	
	Industrial Organization	3	
39.352	Economics of World Energy and Primary Resources	3	
39.353	Superpower Economics	3	
39.354	Economics of Urban Transportation	3	
39.355	Economics of the Quality of Urban Environment and Control	3	
39.356	Poverty and Discrimination	3	
39.357	Manpower and Anti-Poverty Policies and Programs	3	
39.361	Urban Economics	3	27
		—	

Electives****51****Total Credits****174**

* These must be completed prior to matriculation.

** While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Distribution requirements

	quarter hours
Math-Science	None
Humanities	None
Social Sciences	18
(other than Economics)	
Modern Language	None

Major Concentration Requirements

Same required economics courses as for the B.A. degree plus at least 21 additional quarter hours of advanced economics courses.

ENGLISH

Bachelor of Arts Degree

Distribution Requirements (see page 74 for courses included in the three categories listed below):

	quarter hours	
Math-Science	18	
Humanities	None	
Social Sciences	24	42
	<hr/>	

Liberal Arts Requirements

*30.305, 30.306, 30.307	English I, II, III	9	
Modern Language:	Elementary or Conversational	12	
	Intermediate	12	33
		<hr/>	

Major Concentration Courses**Preliminary Courses—all courses required**

30.341, 30.342, 30.343	English Literature I, II, III	9	
30.344, 30.345, 30.346	American Literature I, II, III,	9	18
		<hr/>	

Major Figures—three courses required

30.351, 30.352, 30.353	Chaucer I, II, III	9	
30.354, 30.355, 30.356	Shakespeare I, II, III	9	
	Spenser	3	
30.362, 30.363	Milton I, II	6	9
		<hr/>	

English Literature—three courses required

	30.357	The Seventeenth Century	3	
	30.358, 30.359	The Eighteenth Century I, II	6	
	30.371, 30.372	The Nineteenth Century I, II	6	
	30.373	The Twentieth Century	3	
	30.374	The Eighteenth-Century English Novel	3	
	30.375	The Nineteenth-Century English Novel	3	
	30.376	The Twentieth-Century English Novel	3	9
		<hr/>		

American Literature—three courses required

	30.381	The American Short Story	3	
	30.382	The Nineteenth-Century American Novel	3	
	30.383	The Twentieth-Century American Novel	3	
	30.378, 30.379	Afro-American Literature I, II,	6	
	30.339	Irish Writers in America	3	
	30.349	American Women Writers	3	
	30.384	Contemporary American Poetry	3	9
		<hr/>		

*These must be completed prior to matriculation.

Literature in Translation—three courses required

30.331	The Ancient World	3	
30.332	The Middle Ages	3	
30.333	The Renaissance	3	
30.334	Neoclassicism and Romanticism	3	
30.335	Realism and Naturalism	3	
30.336	The Modern World	3	9

****English Electives****9****Open Electives****36****Total Credits**

174**Bachelor of Science Degree**

Unless otherwise stated, requirements are the same as for the B.A. degree except:

Modern Language	None
English Electives	27
Open Electives	44

**These may include 30.391, 30.392, 30.393 Honors Programs I, II, III.

FINE ARTS

Bachelor of Arts Degree

Distribution Requirements (See page 74 for courses included in the three categories listed below.)

	quarter hours	
Math-Science	18	
Humanities	None	
Social Science	24	42

Liberal Arts Program Requirements

*30.305, 30.306, 30.307	English I, II, III	9	
Modern Language:	Elementary or Conversational	12	
	Intermediate	12	33

Major Concentration Courses—required

27.304, 27.305, 27.306	History of Art I, II, III	9	
------------------------	---------------------------	---	--

In addition to History of Art I, II, III required of all Fine Arts majors, each student will select a minimum of 39 quarter hours in Area I or Area II.

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Modern Language	None	
Electives		75

Area I—Art History Major

		quarter hours	
	27.307	Ancient Architecture	3
	27.308	Medieval and Renaissance Architecture	3
	27.309	European Architecture	3
27.310,	27.311	Ancient Painting and Sculpture I, II	6
	27.312	Medieval Painting and Sculpture	3
	27.314	European Painting	3
27.315,	27.316	Modern Painting I, II	3
	27.318	Twentieth-Century American Architecture	3
	27.319	Twentieth-Century European Architecture	3
	27.320	Italian Renaissance Art II	3
	27.322	French Painting	3
	27.323	English Art	3
27.324, 27.325,	27.326	American Art I, II, III	9
	27.335	African Art	3

*These must be completed prior to matriculation.

		27.336	Latin American Art	3	
		27.338	Chinese Art	3	
		27.339	Japanese Art	3	
		27.347	European Graphic Arts	3	
		27.360	Oriental Indian Art	3	
27.387,	27.388,	27.389	History of Photography I, II, III	9	
		27.392	New York Art Seminar	3	
		27.394	European Art Seminar	3	
27.397,	27.398,	27.399	History and Technique of Film I, II, III	9	
27.400,	27.401,	27.402	Honors Program I, II, III	12	
		27.403	Mexican Art	3	
		27.408	The Arts in Boston	3	
		27.409	History of Sculpture	3	
		27.410	American Indian Art	3	
		27.411	Art and Society I	3	39

Area II—Studio Art Major

27.327,	27.328,	27.329	Life Drawing I, II, III	9	
27.330,	27.331,	27.332	Mixed Media I, II, III	9	
27.341,	27.342,	27.343	Drawing I, II, III	9	
27.344,	27.345,	27.346	Graphic Arts I, II, III	9	
27.351,	27.352,	27.353	Painting—Basic Level I, II, III	9	
27.354,	27.355,	27.356	Painting—Advanced Level I, II, III	9	
27.357,	27.358,	27.359	Advanced Graphic Arts I, II, III	9	
27.361,	27.362,	27.363	Basic Color and Design I, II, III	9	
		27.364	Advanced Color and Design	3	
27.371,	27.372,	27.373	Basic Commercial Design I, II, III	9	
		27.374	Advanced Commercial Design	3	
27.400,	27.401,	27.402	Honors Program I, II, III	12	
27.405,	27.406,	27.407	Watercolor Painting I, II, III	9	39

Electives

51

Total Credits**174**

HISTORY

Bachelor of Arts Degree

Distribution Requirements (see page 74 for courses included in the three categories listed below:)

	quarter hours	
Math-Science	18	
Humanities	24	
Social Sciences	None	42
		<hr/>

Liberal Arts Program Requirements

*30.305, 30.306, 30.307	English I, II, III	9	
Modern Language	Elementary or Conversational	12	
	Intermediate	12	33
		<hr/>	

Major Concentration Courses—required

History majors are required to take 9 quarter hours of History of Civilization (23.301, 23.302, 23.303), 9 quarter hours of the American History survey (23.304, 23.305, 23.306), and 23.300, The Historian's Craft. **21**

Required in addition are 33 quarter hours of history, of which at least 6 quarter hours shall be distributed in *each* of the following four areas:

- | | |
|---|----|
| I. Ancient, Medieval, and Early Modern Europe | |
| II. Modern and Contemporary Europe | |
| III. American History | |
| IV. Other Regions | 24 |

The remaining 9 quarter hours of history may be chosen from any of the above four areas. Students in the honors program may use these 9 quarter hours for the honors courses. **9 33**

Area designations for courses appear with the course listings for history.

Electives**	45
	<hr/>
Total Credits	174

*These must be completed prior to matriculation.

** While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

	quarter hours	
30.305, 30.306, 30.307 English I, II, III	9	
History Major Concentration Courses	54	
Distribution Requirements—	None	
Modern Language	None	
<hr/>		
Social Science Requirements—		
History majors are required to select two of the following sequences:		
19.301, 19.302, 19.303 Psychology I, II, III	9	
20.301, 20.302, 20.303 Anthropology I, II, III	9	
21.301, 21.302, 21.303 Sociology I, II, III	9	
22.301, 22.302, 22.303 Principles of Political Science I, II, III	9	
39.301, 39.302, 39.303 Economic Principles and Problems I, II, III	9	18
<hr/>		
Other Required Courses—		
21.312, 21.313, 21.314 Social Research Methods I, II, III	12	
49.310, 49.311 Electronic Data Processing I, II,	6	18
<hr/>		
Electives		75
<hr/>		
Total Credits		174

LIBERAL ARTS

Associate in Science Degree

Distribution Requirements (see page 74 for courses included in the three categories listed below:)

			quarter hours	
Math-Science*			18	
Humanities*			24	
Social Sciences*			24	
30.305, 30.306, 30.307	English I, II, III		9	75
			<hr/>	
Electives				21
			<hr/>	
Total Credits			96	

*See page 74 for courses included in the various designations.

POLITICAL SCIENCE**Bachelor of Arts Degree**

Distribution Requirements (see page 74 for courses included in the three categories listed below:)

	quarter hours	
Math-Science	18	
Humanities	24	
Social Sciences	None	42
	—	

Liberal Arts Program Requirements

*30.305, 30.306, 30.307	English I, II, III	9	
Modern Language:	Elementary or Conversational	12	
	Intermediate	12	33
		—	

Major Concentration Courses—required (see page 88)

Prerequisites: Principles of Political Science I, II, III (22.301, 22.302, 22.303) which may be taken out of sequence if necessary, or Principles of Political Science (Intensive) (22.304). **9**

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Distribution Requirements	None
Modern Language	None

Additional Requirements—

Statistics		
19.304, 19.305, 19.306	Statistics in Psychology I, II, III	9
or		
39.311, 39.312, 39.313	Statistics I, II, III	
Computer Techniques and Programming		
49.310, 49.311	Electronic Data Processing I, II	6
49.320	COBOL For Non-Programmers	3
Other Electives	to a total of	174

* These must be completed prior to matriculation.

Each student will select a minimum of 7 quarter hours from each of the following four areas, as indicated:

Area I—American Government		quarter hours
22.312	Urban and Metropolitan Government	3
22.314	American Constitutional Law	3
22.315	Civil Rights	3
22.316	Public Administration I	3
22.317	Public Administration II	3
22.318	Government and Politics of States	3
22.319	The Legislative Process	3
22.320	The American Presidency	3
22.328	Procedural Due Process	3
22.351	Current Political Issues	3
22.370	Consumer Advocacy I	3
22.371	Consumer Advocacy II	3
22.372	Consumer Advocacy III	3
		9
Area II—Comparative Government		
22.329	Comparative Politics (Int.)	4
Any additional one course from among:		
22.337	European Political Parties	3
22.344	Government and Politics in the Soviet Union I	3
22.345	Government and Politics in the Soviet Union II	3
22.347	Government and Politics of Communist China I	3
22.348	Government and Politics of Communist China II	3
22.352	Government and Politics of the Middle East I	3
22.353	Government and Politics of the Middle East II	3
22.355	Government and Politics in Latin America I	3
22.356	Government and Politics in Latin America II	3
22.358	Government and Politics of Southeast Asia	3
22.359	Government and Politics of Japan	3
22.360	Politics and Policies of Developing Nations I	3
22.361	Politics and Policies of Developing Nations II	3
22.362	Government and Politics of Sub-Saharan Africa	3
22.363	Government and Politics of Northern Africa	3
		7

Area III—International Relations

22.335	International Relations (not to be taken by students who have credit for 22.331)	4	
Any additional one course from among:			
22.332	International Organization	3	
22.334	Soviet Foreign Policy	3	
22.338	Communist China's Foreign Policy	3	
22.341	International Law	3	
22.333	Formulating American Foreign Policy	3	
22.342	American Foreign Policy I	3	
22.343	American Foreign Policy II	3	
22.364	Communism in Eastern Europe I	3	
22.365	Communism in Eastern Europe II	3	7
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Area IV—Theory and Methodology

22.336	Introduction to Political Theory (not to be taken by students who have credit for 22.304)	4	
Any additional one course from among:			
22.305	Contemporary Political Theory	3	
22.306	American Political Thought	3	
22.308	Research Methods	3	7
<hr/>			

Political Science Electives. A total of 18 quarter hours of elective courses from any or all of the above areas, and may include the maximum number of quarter hours credit for Honors permitted by the College. **18**

Open Electives. Social Sciences other than Political Science, including not fewer than 6 quarter hours of each of three different disciplines selected from Economics, History, Psychology, and Sociology-Anthropology. **27**

Other Electives **15**

Total Credits **174**

PSYCHOLOGY**Bachelor of Arts Degree**

Distribution Requirements (see page 74 for courses included in the three categories listed below:)

	quarter hours	
Math-Science	18	
Humanities	24	
Social Sciences	None	42

Liberal Arts Program Requirements

*30.305, 30.306, 30.307	English I, II, III	9	
Modern Language:	Elementary or Conversational	12	
	Intermediate	12	33

Major Concentration Courses (see below)

Psychology Electives (page 91)	38	
Electives	21	
	40	

Total Credits **174**

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Distribution Requirements—

Math-Science	32	
Humanities	None	
Social Sciences	None	
Modern Language	None	32

English I, II, III **9**

****Major Concentration Courses (see below)** **44**

Psychology Electives (page 91) **15**

Electives To a total of **174**

*****Major Concentration Courses—required**

	quarter hours	
19.301, 19.302, 19.303	(or 19.307) Psychology I, II, III	9
	or	or
19.308, 19.309	Fundamentals of Psychology I, II	8
	or	or
19.318, 19.319	Foundations of Psychology I, II	8
19.304, 19.305, 19.306	Statistics in Psychology I, II, III	9
19.371	Senior Seminar	3

* These must be completed prior to matriculation.

** It is recommended that Psychology majors substitute 19.308, 19.309, Fundamentals of Psychology I and II for 19.301, 19.302, 19.303; and 19.354, 19.355, Psychopathology I and II for 19.341, 19.342, 19.343. Students planning to continue their education beyond the B.A. or B.S. are encouraged to take Scientific Foundations of Psychology I & II (19.361 and 19.362).

*** While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

Three of the following pairs are required for the B.A. degree and four of the following pairs are required for the B.S. degree.

19.314,	19.315	Personality I, II (Lab)		
19.338,	19.340	Learning I, II (Lab)		
19.349,	19.350	Sensation and Perception I, II (Lab)		
19.380,	19.381	Physiological Psychology I, II (Lab)		
				<hr/>
				B.A. 38
				B.S. 44

Psychology Electives

In addition to the courses listed above, required of all Psychology majors, each student will select a minimum of 21 hours (B.A.) and 15 hours (B.S.) from the following Psychology electives:

19.311,	19.312,	19.313	Developmental Psychology I, II, III	9
19.323			Motivation	3
19.324,	19.325		Social Psychology I, II	6
19.332,	19.333,	19.334	Industrial Psychology I, II, III	9
19.336			Psychology of Thought	3
19.337			Psychology of Language	3
19.345			Psychological Therapies	3
19.341,	19.342,	19.343	Abnormal Psychology I, II, III	9
or				or
19.354,	19.355		Psychopathology I, II	8
19.361,	19.362		Scientific Foundations of Psychology I, II	6
19.388			Drugs and Behavior	3
19.389			Impact of Psychology on Society	3
*19.391,	19.392,	19.393	Honors Program I, II, III	12
*19.499			Field Work in Psychology	6

* Students may take any combination of honors and field work courses totalling three (3).

SOCIOLOGY-ANTHROPOLOGY

As of September 1977, in order to matriculate as a sociology-anthropology major, registration in either 21.312 (Social Research Methods I) or 21.317 (Social Theory I) is required. Students already matriculated as majors in the department at that date should complete 21.312, 21.313, 21.314 and 21.317, 21.318, 21.319 as quickly as possible if they have not already done so.

Bachelor of Arts Degree

(Students who matriculated prior to Sept. 1973 must petition the UC Office of Academic and Student Services for this degree)
For students planning to attend graduate school, the Bachelor of Arts degree is recommended.

Distribution Requirements (see page 74 for courses included in the three categories below:)

	quarter hours	
Math-Science	18	
Humanities	24	
Social Sciences	None	42

Liberal Arts Program Requirements

*30.305, 30.306, 30.307	English I, II, III	9	
Modern Language:	Elementary or Conversational	12	
	Intermediate	12	33

Major Concentration Requirements (see below)	60
Electives	39
Total Credits	174

Major Concentration Courses—required

Prerequisites: 21.301, 21.302, 21.303, or 21.304 (unless waived by department)

	quarter hours	
20.301, 20.302, 20.303	Anthropology I, II, III	9
21.312, 21.313, 21.314	Social Research Methods I, II, III	12
21.317, 21.318, 21.319	Social Theory I, II, III	9

*These must be completed prior to matriculation

The student may choose to substitute for course sequences above more intensive versions offered under the following numbers and titles:

20.304	Anthropology (Intensive)	9
20.401, 20.402	Principles of Anthropology I, II	8
21.417, 21.418	Social Theory I, II	8
21.401, 21.402	Principles of Sociology I, II	8

The major is required to take a minimum of 30 quarter hours from the following course offerings:

20.321	Individual and Culture	3
20.331	Social Organization of Non-State Societies	3
20.332	Religion in Cross-Cultural Perspectives	3
20.333	Culture Change	3
20.337	Anthropological Theory	3
20.341	Native American Peoples	3
20.344	African Peoples and Cultures	3
20.345	Ethnology of the Indian Sub-Continent	3
20.346	Society in India	3
20.347	Latin American Peoples and Cultures	3
20.348	Studying the Family Cross-Culturally	3
20.349	Folklore	3
20.350	Peasant Society and Culture	3
20.360	Language and Culture	3
20.499	Fieldwork in Anthropology (or 21.499)	6
21.301	Sociology I	3
21.302	Sociology II	3
21.303	Sociology III	3
21.304	Sociology (Intensive)	9
21.305	Drugs and Society	3
21.306	Sociology of Religion	3
21.307	Sex in Society: The Study of Sex Roles	3
21.308	Sociology of Literature	3
21.309	Sociology of Socialist and Utopian Societies	3
21.328	Social Stratification: Class, Status, and Power	3
21.331	Social Change	3
21.334	Social Control	3
21.335	Political Sociology	3
21.338	(25.338) Intro. to Social Welfare I	3
21.339	(25.339) Intro. to Social Welfare II	3
21.340	(25.340) Intro. to Social Welfare III	3
21.343	(25.343) Intro. to Social Work Practice I	3
21.344	(25.344) Intro. to Social Work Practice II	3
21.345	(25.345) Intro. to Social Work Practice III	3
21.346	Sociology of Deviant Behavior	3
21.347	Social Problems	3
21.350	Juvenile Delinquency	3

21.351,	21.352	Family and Marriage I, II	6	
21.353	21.354	Intergroup Relations I, II	6	
	21.356	Sociology of Inequality	3	
	21.357	Urban Sociology	3	
	21.358	Community Analysis	3	
	21.359	Seminar in Urban Studies	3	
	21.360	Medical Sociology	3	
	21.361	Sociology of Mental Health	3	
	21.363	Social Gerontology: The Aged in Society	3	
	21.364	Sociology of Childhood	3	
	21.365	Sociology of Education	3	
	21.370	Sociology of Occupations and Professions	3	
	21.373	Sociology of Industry	3	
	21.375	Sociology of Formal Organizations	3	
21.391	21.392,	21.393	Honors Program I, II, III	12
		21.499	Fieldwork in Sociology (or 20.499)	6
				<hr/>
Electives*				39
				<hr/>
Total Credits				174

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Distribution Requirements

	quarter hours
Math-Science	None
Humanities	None
Social Sciences (other than soc-anthro)	18
Modern Language	None

For those anticipating work in applied social welfare, it is highly recommended that at least elementary conversational courses in an appropriate language be mastered.

Major Concentration Requirements 78

Same as for B.A. degree plus a minimum of 18 additional quarter hours (of which at least 6 are in Anthropology) taken from the courses offered by the department.

Electives** 174

To a total of

* While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields.

** While students may elect courses in their major field in excess of the minimum requirements, B.S. students especially are strongly encouraged to elect courses in math-science and the humanities to achieve adequate educational breadth.

MUSIC**Bachelor of Arts Degree**

Distribution Requirements (see page 74 for courses included in the three categories listed below)

	quarter hours	
Math-Science	18	
Humanities	None	
Social Sciences	24	42
	<hr/>	

Liberal Arts Program Requirements

*30.305, 30.306, 30.307	English I, II, III	9	
Modern Language:	Elementary or Conversational	12	
	Intermediate	12	33
		<hr/>	

Major Concentration Courses Required

28.399, 28.400, 28.401	Music Theory I, II, III	9	
28.402, 28.403, 28.404,			
28.410	Music History I, II, III, IV	12	
28.371	Piano Class I	3	
28.328, 28.329, 28.330	Ear Training I, II, III	9	33
		<hr/>	

Major Concentration Electives

(Students are required to take a minimum of 24 q.h. from this group of courses.)

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Distribution Requirements—

	quarter hours	
Math-Science	9	
Social Sciences	24	
Modern Language	12	45
	<hr/>	

Major Concentration Courses Required

28.399, 28.400, 28.401	Music Theory I, II, III	9	
28.371, 28.372, 28.373	Piano Class I, II, III	9	
28.328, 28.329, 28.330	Ear Training I, II, III	9	
28.334, 28.335, 28.336	Pedagogy I, II, III	9	
28.337	Conducting I	3	39
		<hr/>	

*These must be completed prior to matriculation.

Major Concentration Electives

(18 q.h. required of which 6 q.h. must be in history of any two periods)

18**Electives**

To a total of

174

(May include Honors 28.495, 28.496, 28.497)

Major Concentration Electives**quarter hours**

28.303	Women in Music	3
28.310	Music and Art	3
28.317	Music as a Means of Social Expression	3
28.320	Musical Forms	3
28.321	The Symphony	3
28.322	The Concerto	3
28.323	Great Literature for the Piano	3
28.324	The World of Opera	3
28.326	Jazz: Evolution and Essence	3
28.331	Life and Works of J. S. Bach	3
28.332	Life and Works of Mozart	3
28.333	Life and Works of Beethoven	3
28.340	The Black Artist in Music	3
28.341	Nationalism in Music	3
28.342	Music USA	3
28.343	Great Choral Literature	3
28.344	Chamber Music	3
28.345	Wagner's Ring Cycle	3
28.346	Life and Work of Stravinsky	3
28.347	The Music of Bruckner and Mahler	3
28.348	Great Love Songs Through the Ages	3
28.349	A History of Musical Instruments in Western Culture	3
28.350	Life and Works of Haydn	3
28.351	Life and Works of Brahms	3
28.352	Life and Works of Chopin	3
28.353	Melodrama and the Macabre: Aspects of Romanticism in Music	3
28.355	Contemporary Opera	3
28.374	Orchestral Instrument Class I	3
28.375	Orchestral Instrument Class II	3
28.376	Orchestral Instrument Class III	3
28.377	Voice Culture I	3
28.378	Voice Culture II	3
28.379	Voice Culture III	3
28.398	American Musical Theatre	3
28.354	European Music and Art	3
28.358	Life and Works of Debussy	3
28.359	Life and Works of Verdi	3

24**Humanities Electives** (other than Music)**15****Free Electives****27****42****Total Credits****174**

CHEMICAL-BIOLOGICAL TECHNOLOGY

Associate in Science Degree

The program in Chemical-Biological Technology helps provide the chemistry and biology foundation required by medical and industrial laboratory assistants and technicians in clinically, chemically, or biologically oriented organizations, and for persons having paramedical responsibilities. Employment opportunities are in hospitals, health clinics, research foundations, chemical and drug industries, public health organizations, water and sanitation departments, and in the emerging fields of the oceanographic technologies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

				quarter hours	
First Year					
10.527,	10.528,	10.529	Mathematics I, II, III	9	
			or	or	
10.307,	10.308		College Algebra and Trigonometry I, II	8	
11.304,	11.305,	11.306	General Physics I, II, III	6	
12.444,	12.445,	12.446	General Chemistry I, II, III	9	
30.305,	30.306,	30.307	English I, II, III	9	32-33
				<hr/>	
Second Year					
10.316,	10.317,	10.318	Probability and Statistics I, II, III	6	
			or	or	
10.320,	10.321,	10.322	Calculus I, II, III	8	
			Social Science Elective I, II, III	9	
18.411,	18.412,	18.413	Biology I, II, III	12	27-29
				<hr/>	
Third Year					
12.431,	12.432,	12.433	Organic Chemistry I, II, III	12	
			or	or	
12.421,	12.422,	12.423	Analytical Chemistry I, II, III	9	
18.424,	18.425,	18.426	Human Anatomy and Physiology I, II, III	9	
			Humanities Elective I, II, III	9	27-30
				<hr/>	
Fourth Year					
18.421,	18.422,	18.423	Microbiology I, II, III	9	
			Chemistry or Biology Electives		
			(as needed to complete total credits)		<hr/>
Total Credits					96-100

Note: Associate degree graduates may transfer applicable credits toward the requirements in Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees, as well as University College programs.

**CHEMICAL-BIOLOGICAL
TECHNOLOGY**
Bachelor of Science Degree

The Chemical-Biological Technology program is an interdisciplinary program integrating theoretical and laboratory course sequences from the fields of chemistry and biology which gives the opportunity for the student to prepare to assume responsibilities in laboratory careers which emphasize laboratory application and teaching careers in general science. Employment opportunities may be found in a wide variety of industrial, pharmaceutical, clinical, and hospital laboratories dealing with analytical, production, and research functions and in secondary school education in the teaching of general science, chemistry, biology, and other related courses.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

First Year				quarter hours
10.527,	10.528,	10.529	Mathematics I, II, III	9
			or	or
10.307,	10.308		College Algebra & Trigonometry I, II	8
11.304,	11.305,	11.306	General Physics I, II, III	6
12.444,	12.445,	12.446	General Chemistry I, II, III	9
30.305,	30.306,	30.307	English I, II, III	9 32-33

Second Year				
10.316,	10.317,	10.318	Probability and Statistics I, II, III	6
			or	or
10.320,	10.321,	10.322	Calculus I, II, III	8
18.411,	18.412,	18.413	Biology I, II, III	12
23.301,	23.302,	23.303	History of Civilization I, II, III	9 27-29

Third Year				
12.421,	12.422,	12.423	Analytical Chemistry I, II, III	9
18.424,	18.425,	18.426	Human Anatomy and Physiology I, II, III	9
19.301,	19.302,	19.303	Psychology I, II, III	9 27

Fourth Year				
12.431,	12.432,	12.433	Organic Chemistry I, II, III	12
18.421,	18.422,	18.423	Microbiology I, II, III	9 21

Fifth Year

18.451,	18.452,	18.453	Histology-Organology I, II, III	6	
39.301,	39.302,	39.303	Economics I, II, III	9	
12.451,	12.452		Instrumental Analysis I, II	6	
		12.453	Radiochemistry	3	
16.331,	16.332,	16.333	Oceanology I, II, III	9	33

Sixth Year

18.461,	18.462,	18.463	Ecology I, II, III	9	
12.441,	12.442,	12.443	Physical Chemistry I, II, III	9	
			or	or	
12.415,	12.416,	12.417	Biochemistry I, II, III	9	
21.301,	21.302,	21.303	Sociology I, II, III	9	27

Seventh Year

18.457,	18.458		Genetics I, II		
			or	6	
18.431,	18.432		Cell Biology I, II		
		18.459	Genetics Lab		
			or	2	8
		18.433	Cell Biology Lab		
			Electives as needed to complete total credits		

Total Credits**175-178****

** General Science Teacher Option—Students planning to apply to the Northeastern University Graduate School of Education must include courses in Adolescent Psychology and Principles of Teaching among the electives.

law enforcement

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Director, Law Enforcement Programs
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Aims

Law Enforcement programs of study are offered to meet the needs of present and potential practitioners in the fields of corrections, law enforcement, and security who wish to have the opportunity to acquire a liberal education as well as professional competence or to gain recognition for development and attainment while pursuing a career in that profession. Classes are tailored to suit the shifting tours of duty of many of its students, with the result that day and evening students meet on common ground. These students reflect broad differences in age, as well as in occupation, goals, race, and religion.

Methods

The distribution requirements, including certain required courses, are shown with each curriculum. Upon petition, students may be permitted under certain circumstances to substitute other courses which will more adequately serve their specific objectives.

To provide a balanced program which will achieve the established objectives, the faculty has set minimum requirements in the areas of study outlined on the following pages.

Bachelor of Science Degree Program

Major fields of study are offered in Correctional Practices, Law Enforcement, and Security. Students should choose their major field of study in consultation with a program adviser.

Each curriculum provides for not less than 174 quarter hours of work, including at least 75 quarter hours of advanced work in a major field.

No student who has transferred from another institution is eligible to receive a degree until at least 45 to 46 quarter hours of academic work have been completed at University College of Northeastern University immediately preceding graduation.

Associate in Science Degree Program

The program leading to the associate degree is offered for those who wish to obtain a general background in correctional practices, law enforcement, or security, and later may wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements for the Bachelor of Science degree, and includes at least 48 quarter hours of work in a major field.

Honors Program

*The Honors Program in the field of law enforcement is designed to provide qualified students with the opportunity to achieve a broader and deeper intellectual academic experience within their chosen fields: corrections, law enforcement, or security.

In general, the Honors Program consists of the following areas: independent study, directed reading seminar, independent research projects, and special seminars.

The particular academic structure of a student's Honors Program will be arranged in consultation with the Program Director and the Honors Faculty Committee.

The Honors Program is open to all matriculated Law Enforcement Program students in University College who have obtained an associate degree or equivalent and a minimum cumulative grade point average of 3.0. Students who are eligible for this program may apply for admission and approval to the Director of Law Enforcement Programs.

Advanced Standing Credit—Credit for Non-Collegiate Experience (NCE)

A matriculated University College student with a department major in Corrections, Law Enforcement, or Security, may obtain up to 18 quarter hours of credit (excluding CLEP), by petitioning to take a comprehensive examination in the specific subject area based upon the student's knowledge acquired in a non-traditional manner. Petitions for these examinations may be obtained in Room 102 Churchill Hall or Room 200 Churchill Hall.

In no case will this credit be considered as partial fulfillment of the residence requirement nor will a letter grade be assigned.

No credit will be assigned in this manner for courses which can be accredited through the CLEP Testing Program at the time of the petition. Credit will only be assigned to specific courses. It is possible that this credit may be applicable toward a degree in University College only.

*For course numbers see page 276.

Distribution Requirements

For the purpose of satisfying the distribution requirements in all Law Enforcement programs, all students should discuss their academic program with a program adviser before attempting to undertake their program of study.

Courses 30.305, 30.306, 30.307, English I, II, III (9 quarter hours), must be taken by each student prior to matriculation. (Refer to page 28 regarding matriculation.) The remaining courses amounting to 30 quarter hours should be taken from the distribution of the Basic Required, Core Required, and Major Concentration Courses as follows:

LAW ENFORCEMENT**quarter hours**

30.305,	30.306,	30.307	English I, II, III	9
19.301,	19.302,	19.303	Psychology I, II, III	9
23.304,	23.305,	23.306	American History I, II, III	9
94.304,	94.305		Criminal Investigation and Case Preparation I, II	6
94.325,	94.326		Intro. to Criminalistics I, II	6
94.387,	94.388		Administration of Justice, I, II	6
94.391,	94.392		Criminal Law I, II	6

CORRECTIONAL PRACTICES**quarter hours**

30.305,	30.306,	30.307	English I, II, III	9
21.301,	21.302,	21.303	Sociology I, II, III	9
23.304,	23.305,	23.306	American History I, II, III	9
94.322,	94.323		Correctional Administration I, II	6
94.327			The American Correctional System	3
94.338,	94.339		Criminology I, II	6
94.387,	94.388		Administration of Justice I, II	6
94.391,	94.392		Criminal Law I, II	6

SECURITY**quarter hours**

30.305,	30.306,	30.307	English I, II, III	9
21.301,	21.302,	21.303	Sociology I, II, III	9
22.314			American Constitutional Law	3
45.301,	45.302		Management and Organization I, II	6
94.304,	94.305		Crim. Invest. and Case Prep. I, II	6
94.387,	94.388		Administration of Justice I, II	6
94.391,	94.392		Criminal Law I, II	6
94.403,	94.404		Security Administration I, II	6

Course Sequence

Upon completion of the required courses for matriculation, the student should elect courses from the Core and Major Concentration areas in fulfilling the requirement for the Associate in Science and the Bachelor of Science degrees.

Note: The completion of degree requirements may be accomplished at the student's own pace. A total of 32 courses is required for an associate in science degree, which can be completed over a period of three years, or nine academic quarters. A bachelor of science degree can be completed over a period of five years, or fifteen academic quarters. This schedule will average out to four courses per academic quarter.

Refer to page 36, Academic Policy/Maximum Academic Course Load.

Intensive Courses

Many courses are frequently offered as single quarter intensives during the regular school year. Please refer to the listing of courses on page 276.

Intensive courses offer the opportunity for students to achieve their objectives in a shorter period of time.

CORRECTIONAL PRACTICES**Bachelor of Science Degree****Basic Courses—required****quarter hours**

19.301,	19.302,	19.303	Psychology I, II, III	9	
21.301,	21.302,	21.303	Sociology I, II, III	9	
30.305,	30.306,	30.307	English I, II, III	9	
94.361,	94.362		Law Enforcement Mathematics I, II**	6	33
				—	

Core Courses—required

21.334			Social Control	3	
21.347			Social Problems	3	
23.304,	23.305,	23.306	American History I, II, III	9	
49.400,	49.401		Human Relations in Organizations I, II	6	21
				—	

Core Electives

Select 33 quarter hours from the following:

19.324,	19.325		Social Psychology I, II	6	
19.341,	19.342,	19.343	Abnormal Psychology I, II, III	9	
20.301,	20.302,	20.303	Anthropology I, II, III	9	
21.353,	21.354		Intergroup Relations I, II	6	
21.357			Urban Sociology	3	
22.301,	22.302,	22.303	Principles of Political Science I, II, III	9	
22.314			American Constitutional Law	3	
22.315			Civil Rights	3	
22.316,	22.317		Public Administration I, II	6	
23.301,	23.302,	23.303	History of Civilization I, II, III	9	
39.301,	39.302,	39.303	Economic Principles and Problems I, II, III	9	
49.400,	49.401		Human Relations in Organizations I, II	6	
				—	33

Major Concentration Courses—required

94.301			Human Rights in Corrections	3	
94.303			Correctional Counseling	3	
94.311,	94.312		Advanced Correctional Practices I, II	6	
94.327			The American Correctional System	3	
94.330,	94.331		Treatment of Offenders I, II	6	
94.332,	94.333		Correctional Administration I, II	6	
94.338,	94.339		Criminology I, II	6	
94.341,	94.342		Probation and Parole Practices I, II	6	
94.387,	94.388		Administration of Justice I, II	6	
94.391,	94.392		Criminal Law I, II	6	51
				—	

** 41.301, 41.302, Accounting Principles I and II may be taken in place of 94.361, 94.362, Law Enforcement Mathematics I and II.

Elective Major Concentration Courses

A total of 36 quarter hours from the following courses. Not more than 18 quarter hours of seminar courses may be elected to satisfy this requirement.

94.302		Basic Statistics in L.E.	3	
94.316		The Law and Institutional Treatment	3	
94.317		Comparative Correctional Systems	3	
94.318,	94.319	Law Enforcement Ident. and Records I, II	6	
94.328,	94.329	Social Deviance I, II	6	
94.340		Delinquency Prevention	3	
94.345,	94.346	Juvenile Corrections I, II	6	
94.357		Seminar in Correctional Practices	3	
94.358		National Law Enforcement Seminar	3	
94.359		Hospital Security	3	
94.364		Seminar in L.E.—(Youth Crime Control)	3	
94.365		Seminar in L.E.—(Victimology)	3	
94.366		Seminar in L.E.—(International Crime Control)	3	
94.367		Seminar in L.E.—(Grantsmanship)	3	
94.368		Seminar in L.E.—(Operational Intelligence)	3	
94.370		Seminar in L.E.—(Collective Bargaining)	3	
94.371,	94.372	Man, Law, and Society I, II	6	
94.375		Seminar in L.E.—(Organized Crime)	3	
94.376		Seminar in L.E.—(Minorities and the Urban Crisis)	3	
94.377		Seminar in L.E.—(Criminal Behavior)	3	
94.380		Seminar in L.E.—(Intervention Strategies)	3	
94.383		Seminar in L.E.—(Drugs)	3	
94.384		Seminar in L.E.—(Executive Development)	3	
94.385		Seminar in L.E.—(Mental Health and the Police)	3	
94.386		Seminar in L.E.—(Data Processing)	3	
94.389,	94.390	Civil Law in Criminal Justice I, II	6	
94.393,	94.394	Evidence and Court Procedure I, II	6	
94.395,	94.396	Fire Investigation and Arson I, II	6	
94.397		Law Enforcement Fiscal Management	3	
94.398		Massachusetts Criminal Law	3	
94.399		Alcohol Problems in Law Enforcement	3	36
Total Credits				174

Additional departmental offerings on selections of intensive courses appear on pages 276 through 277.

CORRECTIONAL PRACTICES

Associate in Science Degree

Basic Courses—required				quarter hours	
21.301,	21.302,	21.303	Sociology I, II, III	9	
30.305,	30.306,	30.307	English I, II, III	9	18
				—	

Core Courses—required					
23.304,	23.305,	23.306	American History I, II, III	9	9
				—	

Core Electives

A total of 21 quarter hours from the following courses:

19.301,	19.302,	19.303	Psychology I, II, III	9	
19.324,	19.325		Social Psychology I, II	6	
19.341,	19.342,	19.343	Abnormal Psychology I, II, III	9	
21.334			Social Control	3	
21.347			Social Problems	3	
21.357			Urban Sociology	3	
21.353,	21.354		Intergroup Relations I, II	6	
22.314			American Constitutional Law	3	
22.315			Civil Rights	3	
22.316,	22.317		Public Administration I, II	6	
23.301,	23.302,	23.303	History of Civilization I, II, III	9	
49.400,	49.401		Human Relations in Organization I, II	6	21
				—	

Major Concentration Courses—required

94.327		The American Correctional System	3	
94.332,	94.333	Correctional Administration I, II	6	
94.338,	94.339	Criminology I, II	6	
94.387,	94.388	Administration of Justice I, II	6	
94.391,	94.392	Criminal Law I, II	6	27
				—

Elective Major Concentration Courses

A total of 21 quarter hours of credit from the following courses. Not more than 9 quarter hours of seminar courses may be elected to satisfy this requirement.

94.301		Human Rights in Corrections	3	
94.303		Correctional Counseling	3	
94.311, 94.312		Advanced Correctional Practices I, II	6	
94.316		The Law and Institutional Treatment	3	
94.320		Basic Statistics in Law Enforcement	3	
94.322		Research Methods in Criminal Justice	3	
94.328, 94.329		Social Deviance I, II	6	
94.330, 94.331		Treatment of Offenders I, II	6	
94.340		Delinquency Prevention	3	
94.341, 94.342		Probation and Parole Practices I, II	6	
94.345, 94.346		Juvenile Corrections I, II	6	
94.357		Seminar in Correctional Practices	3	
94.358		The National Law Enforcement Seminar	3	
94.365		Seminar in Law Enforcement—(Victimology)	3	
94.371, 94.372		Man, Law, and Society I, II	6	
94.377		Seminar in L.E.—(Criminal Behavior)	3	
94.383		Seminar in L.E.—(Drugs)	3	
94.386		Seminar in L.E.—(Data Processing)	3	
94.393, 94.394		Evidence & Court Procedure I, II	6	
94.399		Alcohol Problems in L.E.	3	21
			—	—
Total Credits				96

Additional departmental offerings on selections of intensive courses appear on pages 276 through 277.

LAW ENFORCEMENT

Bachelor of Science Degree

Basic Courses—required

quarter hours

19.301,	19.302,	19.303	Psychology I, II, III	9	
21.301,	21.302,	21.303	Sociology I, II, III	9	
30.305,	30.306,	30.307	English I, II, III	9	
94.361,	94.362		Law Enforcement Mathematics I, II**	6	33

Core Courses—required

23.304,	23.305,	23.306	American History I, II, III	9	
39.301,	39.302,	39.303	Economic Principles and Problems I, II, III	9	18

Elective Core Courses

A total of 39 quarter hours from the following courses:

19.324,	19.325		Social Psychology I, II	6	
19.341,	19.342,	19.343	Abnormal Psychology I, II, III	9	
21.334			Social Control	3	
21.347			Social Problems	3	
22.301,	22.302,	22.303	Prin. of Political Science I, II, III	9	
22.314			American Constitutional Law	3	
22.315			Civil Rights	3	
22.316,	22.317		Public Administration I, II	6	
23.301,	23.302,	23.303	History of Civilization I, II, III	9	
29.307			Business and Professional Speaking	3	
26.331,	26.332,	26.333	Ethics I, II, III	9	
26.334			Logic	3	
39.342			Economics of Crime	3	
49.400,	49.401		Human Relations in Organization I, II	6	33

Major Concentration Courses—required

94.304,	94.305		Criminal Invest. and Case Prep. I, II	6	
94.308,	94.309		Interviews and Interrogations I, II	6	
94.325,	94.326		Intro. to Criminalistics I, II	6	
94.338,	94.339		Criminology I, II	6	
94.343,	94.344		L.E. Management and Planning I, II	6	
94.371,	94.372		Man, Law and Society I, II	6	
94.387,	94.388		Administration of Justice I, II	6	
94.391,	94.392		Criminal Law I, II	6	48

** 41.301, 41.302. Accounting Principles I, II, may be taken in place of 94.361, 94.362, Law Enforcement Math I, II.

Elective Major Concentration Courses

A total of 42 quarter hours from the following courses. Not more than 18 quarter hours of seminar courses may be elected to satisfy this requirement.

		quarter hours	
94.302		Basic Statistics in Law Enforcement	3
94.306		Comparative Police Systems	3
94.314,	94.315	Traffic Safety and Control I, II	6
94.318,	94.319	L.E. Identification and Records I, II	6
94.320		Police Public Relations	3
94.321		Police Community Relations	3
94.322		Research Methods in Criminal Justice	3
94.323,	94.324	The Patrol Function I, II	6
94.328,	94.329	Social Deviance I, II	6
94.335		Investigative Report Writing	3
94.336		Police Supervision	3
94.337		Police Work with Juveniles	3
94.340		Delinquency Prevention	3
94.358		National Law Enforcement Seminar	3
94.364		Seminar in L.E.—(Youth Crime Control)	3
94.365		Seminar in L.E.—(Victimology)	3
94.366		Seminar in L.E.—(International Crime Control)	3
94.367		Seminar in L.E.—(Grantsmanship)	3
94.368		Seminar in L.E.—(Operational Intelligence)	3
94.370		Seminar in L.E.—(Collective Bargaining)	3
94.374		Seminar in L.E.—(Interviewing Practicum)	3
94.375		Seminar in L.E.—(Organized Crime)	3
94.376		Seminar in L.E.—(Minorities and the Urban Crisis)	3
94.377		Seminar in L.E.—(Criminal Behavior)	3
94.378		Seminar in L.E.—(Prosecutive Development)	3
94.379		Seminar in L.E.—(Forensic Laboratory)	3
94.380		Seminar in L.E.—(Intervention Strategies)	3
94.381,	94.382	Civil Liberties and the Police I, II	6
94.383		Seminar in L.E.—(Drugs)	3
94.384		Seminar in L.E.—(Executive Development)	3
94.385		Seminar in L.E.—(Mental Health and the Police)	3
94.386		Seminar in L.E.—(Data Processing)	3
94.389,	94.390	Civil Law in Criminal Justice I, II	6
94.393,	94.394	Evidence and Court Procedure I, II	6
94.395,	94.396	Fire Investigation and Arson I, II	6
94.397		Law Enforcement Fiscal Management	3
94.398		Massachusetts Criminal Law	3
94.399		Alcohol Problems in L.E.	3
			42
			—
		Total Credits	174

Additional departmental offerings on selections of intensive courses appear on pages 276 through 277.

LAW ENFORCEMENT

Associate in Science Degree

Basic Courses—required			quarter hours	
19.301,	19.302,	19.303	Psychology I, II, III	9
30.305,	30.306,	30.307	English I, II, III	9
				18

Core Courses—required				
23.304,	23.305,	23.306	American History I, II, III	9
				9

Elective Core Courses

A total of 21 quarter hours from the following courses:

19.324,	19.325	Social Psychology I, II	6	
19.341,	19.342,	19.343	Abnormal Psychology I, II, III	9
21.301,	21.302,	21.303	Sociology I, II, III	9
21.334		Social Control	3	
22.301,	22.302,	22.303	Principles of Political Science I, II, III	9
22.314		American Constitutional Law	3	
22.315		Civil Rights	3	
22.316,	22.317	Public Administration I, II	6	
23.301,	23.302,	23.303	History of Civilization I, II, III	9
26.331,	26.332,	26.333	Ethics I, II, III	9
26.334		Logic	3	
29.307		Business and Professional Speaking	3	21

Major Concentration Courses Required

94.304,	94.305	Criminal Investigation and Case Prep. I, II	6	
94.325,	94.326	Introduction to Criminalistics I, II	6	
94.387,	94.388	Administration of Justice I, II	6	
94.391,	94.392	Criminal Law I, II	6	24

Elective Major Concentration Courses

A total of 24 quarter hours from the following courses. Not more than 6 quarter hours of seminar courses may be elected to satisfy this requirement.

			quarter hours	
94.302		Basic Statistics in Law Enforcement	3	
94.308,	94.309	Interviews and Interrogations I, II	6	
94.314,	94.315	Traffic Safety and Control I, II	6	
94.320		Police Public Relations	3	
94.321		Police Community Relations	3	
94.322		Research Methods in Criminal Justice	3	
94.323,	94.324	The Patrol Function I, II	6	
94.328,	94.329	Social Deviance I, II	6	
94.335		Investigative Report Writing	3	
94.336		Police Supervision	3	
94.337		Police Work with Juveniles	3	
94.338,	94.339	Criminology I, II	6	
94.340		Delinquency Prevention	3	
94.358		National Law Enforcement Seminar	3	
94.365		Seminar in L.E.—(Victimology)	3	
94.371,	94.372	Man, Law, and Society I, II	6	
94.377		Seminar in L.E.—(Criminal Behavior)	3	
94.383		Seminar in L.E.—(Drugs)	3	
94.386		Seminar in L.E.—(Data Processing)	3	
94.389,	94.390	Civil Law in Criminal Justice I, II	6	
94.393,	94.394	Evidence and Court Procedure I, II	6	
94.395,	94.396	Fire Investigation and Arson I, II	6	
94.398		Massachusetts Criminal Law	3	
94.399		Alcohol Problems in Law Enforcement	3	24
Total Credits			—	96

Additional departmental offerings on selections of intensive courses appear on pages 276 through 277.

SECURITY**Bachelor of Science Degree****Basic Courses—Required**

				quarter hours	
19.301,	19.302,	19.303	Psychology I, II, III	9	
21.301,	21.302,	21.303	Sociology I, II, III	9	
30.305,	30.306,	30.307	English I, II, III	9	
39.301,	39.302,	39.303	Economic Principles and Problems I, II, III	9	36
				—	

Core Courses—Required

22.314		American Constitutional Law	3	
41.301,	41.302	Accounting Principles I, II**	6	
45.301,	45.302	Management and Organization I, II	6	15

Elective Core Courses

A total of 36 quarter hours from the following courses:

19.332,	19.333,	19.334	Industrial Psychology I, II, III	9	
22.301,	22.302,	22.303	Principles of Political Science I, II, III	9	
22.315			Civil Rights	3	
22.316,	22.317		Public Administration I, II	6	
23.301,	23.302,	23.303	History of Civilization I, II, III	9	
23.304,	23.305,	23.306	American History I, II, III	9	
26.331,	26.332,	26.333	Ethics I, II, III	9	
26.334			Logic	3	
29.307			Business and Professional Speaking	3	
44.301			Introduction to Finance	3	
45.405			Industrial Safety	3	
49.310,	49.311		Electronic Data Processing I, II	6	
49.337			Privacy and Security (Computer Security)	3	
49.420,	49.421		Labor Management Relations I, II	6	36
				—	

Major Concentration Courses—Required

94.304,	94.305	Criminal Investigation and Case Prep. I, II	6	
94.308,	94.309	Interviews and Interrogations I, II	6	
94.343,	94.344	Law Enforcement Mgmt. and Planning I, II	6	
94.387,	94.388	Administration of Justice I, II	6	
94.391,	94.392	Criminal Law I, II	6	
94.393,	94.394	Evidence and Court Procedure I, II	6	
94.403,	94.404	Security Administration I, II	6	42

**94.361, 94.362, Law Enforcement Mathematics I and II, may be taken in place of 41.301, 41.302, Accounting Principles I and II

Elective Major Concentration Courses

A total of 45 quarter hours from the following courses. Not more than 18 quarter hours of seminar courses may be elected to satisfy this requirement.

94.307		Intro. to Industrial Security	3	
94.318,	94.319	Law Enforcement Ident. and Records I, II	6	
94.322		Research Methods in Criminal Justice	3	
94.323,	94.324	The Patrol Function I, II	6	
94.325,	94.326	Introduction to Criminalistics I, II	6	
94.328,	94.329	Social Deviance I, II	6	
94.335		Investigative Report Writing	3	
94.338,	94.339	Criminology I, II	6	
94.340		Delinquency Prevention	3	
94.350		Document Control	3	
94.351		Industrial Fire Prevention	3	
94.352,	94.353	Physical Security I, II	6	
94.354		Retail Security	3	
94.355		Bank Security Measures	3	
94.358		National Law Enforcement Seminar	3	
94.359		Hospital Security	3	
94.360		Seminar in Security—(Current Problems)	3	
94.365		Seminar in L.E.—(Victimology)	3	
94.368		Seminar in L.E.—(Operational Intelligence)	3	
94.370		Seminar in L.E.—(Collective Bargaining)	3	
94.371,	94.372	Man, Law, and Society I, II	6	
94.375		Seminar in L.E.—(Organized Crime)	3	
94.377		Seminar in L.E.—(Criminal Behavior)	3	
94.389,	94.390	Civil Law in Criminal Justice I, II	6	
94.395,	94.396	Fire Investigation and Arson I, II	6	
94.406		Legal Aspects of Security Operations	3	
94.407		Introduction to Government Security	3	45
Total Credits			—	174

Additional departmental offerings on selections of intensive courses appear on pages 276 through 277.

SECURITY**Associate In Science Degree****Basic Courses—Required**

			quarter hours	
21.301,	21.302,	21.303	Sociology I, II, III	9
30.305,	30.306,	30.307	English I, II, III	9
				18

Core Courses—Required

22.314			American Constitutional Law	3	
45.301,	45.302		Management and Organization I, II	6	9

Elective Core Courses

A total of 21 quarter hours from the following courses:

19.301,	19.302,	19.303	Psychology I, II, III	9	
19.332,	19.333,	19.334	Industrial Psychology I, II, III	9	
22.315			Civil Rights	3	
22.316,	22.317		Public Administration I, II	6	
23.301,	23.302,	23.303	History of Civilization I, II, III	9	
23.304,	23.305,	23.306	American History I, II, III	9	
26.331,	26.332,	26.333	Ethics I, II, III	9	
26.334			Logic	3	
29.307			Business and Professional Speaking	3	
41.301,	41.302		Accounting Principles I, II	6	
44.301			Introduction to Finance	3	
45.405			Industrial Safety	3	
49.310,	49.311		Electronic Data Processing I, II	6	
49.420,	49.421		Labor Management Relations I, II	6	21

Major Concentration Courses—Required

94.304,	94.305		Criminal Investigation and Case Prep. I, II	6	
94.387,	94.388		Administration of Justice I, II	6	
94.391,	94.392		Criminal Law I, II	6	
94.403,	94.404		Security Administration I, II	6	24

Elective Major Concentration Courses

A total of 24 quarter hours of credit from the following courses. Not more than 9 quarter hours of seminar courses may be elected to satisfy this requirement.

94.307		Intro. to Industrial Security	3	
94.308,	94.309	Interviews and Interrogations I, II	6	
94.323,	94.324	The Patrol Function I, II	6	
94.325,	94.326	Introduction to Criminalistics I, II	6	
94.335		Investigative Report Writing	3	
94.338,	94.339	Criminology I, II	6	
94.340		Delinquency Prevention	3	
94.343,	94.344	Law Enforcement Management and Planning I, II	6	
94.350		Document Control	3	
94.351		Industrial Fire Prevention	3	
94.352,	94.353	Physical Security I, II	6	
94.354		Retail Security	3	
94.355		Bank Security Measures	3	
94.358		National Law Enforcement Seminar	3	
94.360		Seminar in Security (Current Problems)	3	
94.365		Seminar in L.E.—(Victimology)	3	
94.368		Seminar in L.E.—(Operational Intelligence)	3	
94.371,	94.372	Man, Law, and Society I, II	6	
94.375		Seminar in L.E.—(Organized Crime)	3	
94.377		Seminar in L.E.—(Criminal Behavior)	3	
94.389,	94.390	Civil Law in Criminal Justice I, II	6	
94.393,	94.394	Evidence and Court Procedure I, II	6	
94.395,	94.396	Fire Investigation and Arson I, II	6	
94.406		Legal Aspects of Security Operations	3	
94.407		Introduction to Government Security Prog.	3	24
			—	—
Total Credits				96

Additional departmental offerings on selections of intensive courses appear on pages 276-277.

health professions programs

Marjorie Koretsky, Assistant Dean
Director, Health Professions Programs
Telephone 437-2425

Consultants

Prof. Judith Barr, (College of Pharmacy & Allied Health), 437-3321
Prof. Judith Weilerstein, (College of Pharmacy & Allied Health), 437-3321

Aims

Programs in Allied Health are offered through University College to help students prepare for advancement and service in hospitals and other health agencies through part-time study.

Degree programs, both associate and baccalaureate, are designed to provide professional specialization and general educational development. All programs are designed to meet the accreditation standards of the Council on Medical Education of the American Medical Association and of licensing or registration boards where such exist.

The Council on Medical Education (C.M.E.) is responsible for adopting essentials (minimal standards for A.M.A. accreditation) for allied health education programs with the advice of A.M.A. section councils, medical specialty societies and allied health organizations. The U.S. Commissioner of Education and the nongovernmental Council on Postsecondary Accreditation recognize the A.M.A. and collaborating organizations to accredit educational programs for established allied health occupations.

Course Distribution

It is the goal of Northeastern University to offer students a balanced educative background. To this end, the following curriculum design will be in effect for most programs:

Professional and Professionally-related	35 - 50%
Basic and Allied Sciences	25 - 40%
Liberal Arts (non-science)	25 - 40%

Students will choose electives to fulfill course distribution requirements and to equal the number of credits required for the specific degree.

Clinical Assignments

Clinical assignments are generally available for students whose programs require directed applied study in a clinical setting. In most instances didactic information is presented at the University while clinical practice is at various hospitals or other health agencies in the Greater Boston community. Positions for applied clinical studies are often offered on a competitive basis with the student's academic performance in both didactic and basic professional courses used as the basis for the student's acceptance. Academic credit earned during the practicum is usually applicable toward the degree requirement.

Students accepting clinical assignments in health facilities are expected to adhere to requirements of the facility, all of which are outside University control.

HEALTH SCIENCE

Bachelor of Science Degree

The Bachelor of Science Degree in Health Science is available to students holding registration or licensure (as defined by University regulations) in a specific health profession.

Distribution Requirements for the B.S. Degree		quarter hours
A. Liberal Arts (non-science)		42
B. Sciences		44
C. Professional and professionally-related		45 - 48
D. Electives and/or transfer credit		40 - 43
To equal		174

A. LIBERAL ARTS (NON-SCIENCE)

Required:

30.305, 30.306, 30.307	English I, II, III	9
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Humanities (recommended courses):	9
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To be selected from areas beginning with the numbers:

26. - Philosophy & Religion

27. - Fine Arts

28. - Music

29. - Speech & Theatre Arts

30. - English

31. - 34. - Modern Languages

38. - Journalism

Social Sciences (recommended courses):	9
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To be selected from areas beginning with the numbers:

19. - Psychology

20. - Anthropology

21. - Sociology

22. - Political Science

23. - History

25. - Social Welfare

39. - Economics

Electives in above areas	15	42
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B. SCIENCES

Required Basic

18.411, 18.412	Biology I, II	8
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18.424, 18.425, 18.426	Anatomy & Physiology I, II, III	9
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18.421	Microbiology I	3
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10.527, 10.528	Mathematics I, II	6
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41.301, 41.302	Accounting Principles I,II	6
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12.444, 12.445, 12.446	General Chemistry I, II, III	9
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12.407, 12.408, 12.409	Modern Chemistry I-III	9
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Required Advanced

To be taken after matriculation in B.S. program, and to be determined by profession:

Select 9 q.h. from the following:

18.431, 18.432, 18.433	Cell Biology I, II, III	8	
18.438	Immunology	4	
18.420	Medical Microbiology	4	
18.457, 18.458, 18.459	Genetics I, II, III	8	
12.431, 12.432	Organic Chemistry I, II	8	
86.346	Advanced Nutrition	3	
86.347	Advanced Pharmacology	3	
18.451, 18.452, 18.453	Histology-Organology I, II, III	6	
87.310, 87.311, 87.312	Hematology; Morphologic Hematology I, II	9	44

C. PROFESSIONAL AND PROFESSIONALLY RELATED**General Core Required**

86.303, 86.304	Foundations of Medical Science I, II	6	
86.305	Health Science Statistics	3	9

General Core Options

(select 18 q.h. from the following):

86.306	Hospital Law & Ethics	3	
86.320, 86.321	Princ. & Prac. of Comm. Health I, II	6	
86.322	Principles and Practices of Comm. Mental Health	3	
86.323, 86.324	Public Health I, II	6	
86.326, 86.327	Contemporary and Controversial Health Care Issues I, II	6	
87.313	Epidemiology I	3	
86.329	Environmental Problems and Health	3	
86.381	Basic Pharmacology	3	
86.380	Basic Nutrition	3	18

General Educational and Administrative—Required

86.307, 86.308,	Hospital Organization & Management I, II	6	
86.330, 86.331	Health Science Education I, II	6	12

Advanced Professional Options

Courses in professional, health education, or health administration areas to be taken after matriculation in B.S. Select 6 - 9 q.h. from the following:

86.348, 86.349	Health Care Finance I, II	6	
86.310, 86.311	Applied Health Management I, II	6	
86.322	Methods and Materials of Public Health Education	3	
86.333, 86.334	Medical Care and Current Social Problems I, II	6	
86.337	Oral Microbiology	3	
86.338, 86.339	Advanced Periodontology I, II	6	
87.314	Epidemiology II	3	
86.312, 86.313	Communications for Health Care Personnel I, II	6	

6 - 9**D. ELECTIVES**

Electives and/or transfer credits to equal 174 q.h. credits needed for degree.

All students in this program should consult with a program adviser.

HEALTH MANAGEMENT***Bachelor of Science Degree**

Distribution Requirements for the B.S. Degree			quarter hours	
Basic Courses			33	
Liberal Arts			45	
Management			33	
Health Care Administration			30	
Health Care Management Concentration Option			33	174
			—	
Basic Courses—Required				
10.527,	10.528	Mathematics I, II	6	
19.301,	19.302, 19.303	Psychology I, II, III	9	
30.305,	30.306, 30.307	English I, II, III	9	
39.301,	39.302, 39.303	Economics I, II, III	9	33
			—	
Liberal Arts Core Courses—Required				
18.311,	18.312, 18.313	Biology I, II, III	12	
18.324,	18.325, 18.326	Anatomy & Physiology I, II, III	9	
21.301,	21.302, 21.303	Sociology I, II, III	9	
22.301,	22.302, 22.303	Principles of Political Science I, II, III and/or Social Science or Humanities**	15	45
			—	
Management Courses—Required				
86.305		Health Science Statistics	3	
41.301,	41.302	Accounting Principles I, II	6	
44.301		Introduction to Financial Management I	3	
45.301		Management and Organization I	3	
49.310		Electronic Data Processing I	3	
86.312,	86.313	Communication for Health Care Personnel I, II	6	
49.404		Personnel Management I	3	
49.373		Information Processing in Medicine	3	
45.303		Principles and Practices of Management	3	33
			—	
Health Care Administration Courses—Required				
86.306		Hospital Law & Ethics	3	
86.348,	86.349	Health Care Finance I, II	6	
86.303,	86.304	Foundations of Medical Science I, II	6	
86.300		Medical Terminology Survey	3	
86.307,	86.308	Hospital Organization and Management I, II	6	
86.320		Principles and Practices of Community Health I	3	
86.325		Health Care Delivery	3	30
			—	

* Includes special concentration of professional courses to prepare for licensure examination in Long Term Care Administration.

** At least two courses must be in sequence.

quarter hours

Health Care Management Concentrations**33**

Select one of the following concentration options in accordance with your preferred area of administrative focus. Each option is equivalent to 33 q.h. to complete the B.S. degree requirements of 174 q.h.

Option 1 Long Term Care Administration

For licensure as a nursing home administrator, the Board of Registration of Nursing Home Administrators in Massachusetts requires an internship, a licensure examination, plus, as of January 1, 1978, a baccalaureate degree.

The required courses in this option help prepare the student for the licensure examination in Massachusetts.

Required Courses

86.340,	86.341,	86.342	Long Term Care Administration I, II, III	9	
86.343,	86.344,	86.345	Long Term Care Administration IV, V, VI	9	
21.363			Social Gerontology	3	

Electives—Select 12 q.h. from the following, or other electives with permission of adviser.

63.301,	63.302,	63.303	Principles & Practices of Therapeutic Recreation I, II, III	9	
86.381			Basic Pharmacology	3	
86.380			Basic Nutrition	3	
86.310,	86.311		Applied Health Management I, II	6	
86.328			Home Health Care	3	
86.329			Environmental Problems and Health	3	33

Option 2 Community Health Management*Required Courses*

86.310,	86.311	Applied Health Management I, II	6	
86.321		Principles and Practices of Community Health II	3	
87.313		Epidemiology I	3	
86.323		Public Health I	3	

Electives—select 18 q.h. from the following, or other electives with permission of adviser.

86.322		Principles and Practices of Community Mental Health	3	
86.324		Public Health II	3	
86.326,	86.327	Contemporary and Controversial Health Care Issues I, II	6	
86.328		Home Health Care	3	
86.329		Environmental Problems & Health	3	
21.360		Medical Sociology	3	
87.314		Epidemiology II	3	
86.381		Basic Pharmacology	3	
86.380		Basic Nutrition	3	33

Total credits**174**

HEALTH/MEDICAL RECORD ADMINISTRATION

The Profession

The health/medical record administrator has varied responsibilities relating to health information systems. He/she may organize, operate, and manage medical record services. The program offers the student the opportunity to develop the capability to design health information and retrieval systems; to plan, organize and direct medical record services; to develop, analyze and evaluate medical records and indexes; to work with medical and administrative staffs in developing methods for evaluation of patient care, and in research projects utilizing health care information.

The Health/Medical Record Administration Program leading to a baccalaureate degree has been in effect at Northeastern University since 1966. The professional certification program, open to students already holding baccalaureate degrees and offering the required professional courses, was instituted in 1967.

Northeastern University's Programs in Medical Record Administration are approved by the American Medical Association's Council on Medical Education, in collaboration with the Committee on Education and Registration of the American Medical Record Association.

HEALTH/MEDICAL RECORD ADMINISTRATION**Bachelor of Science Degree**

Completion of this program qualifies a student for admission to the professional registration examinations conducted by the American Medical Record Association.

Basic Courses—required

				quarter hours	
	10.527,	10.528	Mathematics I, II	6	
19.301,	19.302,	19.303	Psychology I, II, III	9	
30.305,	30.306,	30.307	English I, II, III	9	
39.301,	39.302,	39.303	Economics I, II, III	9	33
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Liberal Arts Core Courses—required

18.411,	18.412,	18.413	Biology I, II, III	12	
18.424,	18.425,	18.426	Anatomy & Physiology I, II, III	9	
21.301,	21.302,	21.303	Sociology I, II, III	9	
22.301,	22.302,	22.303	Principles & Practices of Political Science I, II, III or		
23.301,	23.302,	23.303	History of Civilization I, II, III	9	
39.311,	39.312		Statistics I, II	6	
<i>Humanities</i>			Arts, English, Language, Philosophy, Music	9	54
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Professional and Professionally-Related Courses—required

49.310			Electronic Data Processing I	3	
49.400			Human Relations in Organizations I	3	
86.362			Hospital Management for Medical Record Administrators	3	
86.358			Medical Record Computer Science	3	
86.306			Hospital Law and Ethics	3	
86.303,	86.304		Foundations of Med. Science I, II	6	
86.301,	86.302		Medical Terminology I, II	4	
86.353,	86.354		Organization of the Medical Records Department I, II*	6	
86.370,	86.371,	86.372	Medical Records Sci. I, II, III*	18	
86.373,	86.374		Medical Records Sci. IV, V*	12	
86.375,	86.360,	86.376	Applied Medical Record Science I, II, III*	8	69
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Elective Courses

Liberal Arts and from any area	22	22
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Total Credits**178**

* Note: Students must maintain a grade level of C or better in professional courses to satisfactorily complete the program.

HEALTH/MEDICAL RECORD ADMINISTRATION Certification Program**Medical Record Program Consultant**

Professor Judith Weilerstein,
College of Pharmacy & Allied Health

Candidates who wish to qualify for admission to the professional examination leading to registration as a Medical Record Administrator, RRA, and who already hold a baccalaureate in another field of study from a college or university acceptable to Northeastern University, may undertake the following course work. Graduates of approved schools in medical record administration are eligible for the national registration examination given by AMRA. Passing this examination gives professional recognition as a Registered Record Administrator (RRA). Successful completion of this course sequence with a cumulative point average of 2.00 will lead to certification from University College that the candidate has completed a professional program in Medical Records Science. In addition to the required courses listed below, candidates must complete one year of a natural science, such as Biology, Chemistry, Microbiology, etc. This requirement is in addition to the laboratory course in Anatomy and Physiology.

Courses required for Professional Certification:				quarter hours
18.424,	18.425,	18.426	Anatomy & Physiology I, II, III	9
86.306			Hospital Law & Ethics	3
86.303,	86.304		Foundations of Medical Science I, II	6
86.301,	86.302		Medical Terminology	4
86.370,	86.371,	86.372	Medical Record Science I, II, III	18
86.373,	86.374		Medical Record Science IV, V	12
86.353,	86.354		Organization of the Medical Records Dept. I, II	6
86.362			Hospital Management for Medical Record Administrators	3
49.310			Electronic Data Processing I	3
86.358			Medical Record Computer Sci.	3
86.375,	86.360,	86.376	Applied Medical Records Science I, II, III	8
86.325			Health Care Delivery	3
Total Credits				78

Candidates who wish to matriculate in this program must be interviewed by the Program Director. Arrangements for this interview may be made through the Allied Health Professions Office, 206 Mugar Building. No candidate will be considered as matriculated until this requirement has been met.

Note: In addition to the required course work, proof of understanding of principles of descriptive statistics must be demonstrated. This requirement may be satisfied by successful completion of an approved statistics course at Northeastern or another University, or completion of University College course 39.311. Statistics I, with a grade of C or better.

MEDICAL LABORATORY SCIENCE—MEDICAL TECHNOLOGY

Bachelor of Science Degree or Associate in Science Degree

The Profession

Medical Technology is a respected and important health profession. The medical technologist has the opportunity to work as a professional in close association with pathologists, doctors, and hospital and medical laboratory personnel. Working in a variety of specialized fields such as bacteriology, blood-banking, histology, hematology, biochemistry, and nuclear and radiochemistry, the medical technologist may make important observations necessary for critical diagnosis by the physician upon early detection and treatment of disease.

The Associate Degree Medical Laboratory Technician likewise may be an important member of the health team. Level of responsibility is commensurate with background and work is in close association with medical technologists and pathologists.

The Registered Medical Technologist and the Associate Degree Medical Laboratory Technician are normally in demand in hospital laboratories, clinics, public health agencies, pharmaceutical firms, research foundations, and in the Armed Forces.

The baccalaureate program in Medical Technology (Medical Laboratory Science) is conducted in affiliation with several Hospital Programs of Medical Technology approved by the Council on Medical Education of the American Medical Association. The program leads to a Bachelor of Science degree, which is awarded by University College, and entitles the student to write the registry examination in Medical Technology MT (ASCP) given by the Board of Registry of Medical Technologists of the American Society of Clinical Pathologists and other certifying examinations.

Students who have appropriate clinical experience may apply to write the AD-MLT (ASCP), Associate Degree Medical Laboratory Technician Examination, upon completion of appropriate courses. University College students will be eligible for an associate degree upon the completion of the courses indicated in the curriculum below and appropriate applied study.

The basic science and general education courses are offered evenings, but the professional courses are offered only full-time, days, in cooperation with the affiliated hospitals.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Introduction to Mathematics I and II (courses 10.301, 10.302).

MEDICAL LABORATORY SCIENCE—MEDICAL TECHNOLOGY

Associate Degree Medical Laboratory Technician and Baccalaureate Degree Medical Technology Program.

Associate Degree Medical Laboratory Technician Program Curriculum*

(Required for both the A.S. and B.S. programs)

General				quarter hours
30.305,	30.306,	30.307	English I, II, III	9
	86.333	86.334	Medical Care and Current Social Prob.	6
		86.306	Hospital Law and Ethics	3
	10.307,	10.308	College Algebra and Trigonometry	8
Biology				
18.411,	18.412,	18.413	Biology I, II, III	12
18.424,	18.425,	18.426	Human Anatomy & Physiology	9
18.421,	(18.422 or 87.104)		Microbiology I (II or 87.104)	6-7(see below)
Chemistry				
12.444,	12.445,	12.446	General Chemistry I, II, III	9
12.427			Analytical Chemistry	4
12.431			Organic Chemistry I	4
MLS **				
87.300			Medical Laboratory Science Orientation	2
87.101			Basic Medical Laboratory Science	4
87.102			Basic Hematology	2
87.103			Basic Immunohematology	2
87.105			Basic Clinical Chemistry	4
87.104			Basic Clinical Microbiology	
or			or	
18.422			Microbiology II	3
Electives				9
			Humanities	9
			Social Science	9
Total credits				103-104

***Professional Requirements for the AD-MLT Program**

The professional requirements include eligibility to write the certification examination for the AD-MLT (ASCP) certification. For students without appropriate clinical studies or work experience as defined by the Board of Registry of the ASCP, clinical applied studies are generally available through the College of Pharmacy and Allied Health Professions. Students must apply for the six month applied study rotations one year in advance of the anticipated time of entry to the courses. Students register as special students in the basic college and tuition is the same as that charged for all basic college medical laboratory science professional courses.

**These courses are available during the evening hours and are offered directly through the College of Pharmacy and Allied Health Professions. Students register as special students in the basic college and tuition will be the same as that charged for all basic college Medical Laboratory Science Professional courses. These courses should be completed within three years of applying to take the AD-MLT Applied Studies, and within 5 years of applying to take the MT Applied Studies.

Bachelor of Science Medical Technology Program

In addition to all courses required for the Associate of Science degree, the following courses are required for the Bachelor of Science degree.

				quarter hours
Biology				
18.457,	18.458,	18.459	Genetics I, II, and Lab	8
18.431,	18.432,	18.433	Cell Biology I, II, and Lab	8
Chemistry				
12.432,	12.433		Organic Chemistry II and III	8
Physics				
11.304,	11.305,	11.306	General Physics I, II, III	6
87.302			Basic MLS Electronics & Instrumentation	2
Electives				
Humanities				3
Social Science				3
Free				6
Clinical Internship (**)				
87.252			Hematology	3
87.253			Immunohematology	2
87.254			Clinical Microbiology	5
87.255			Clinical Chemistry	5
87.162			Applied Hematology	3
87.163			Applied Immunohematology	2
87.164			Applied Clinical Microbiology	5
87.165			Applied Clinical Chemistry	5
87.203			Medical Serology and Immunology	2
87.204			Medical Parasitology	2
87.221			MLS Administration	2
87.226			MLS Education	2
87.281			MLS Seminar	2
87.280			MLS Special Topics	2
87.107			MLS Electronics II	1
Total requirement				186-187

(**) These courses are available only full-time during the day and are offered directly through the College of Pharmacy and Allied Health Professions. Students must apply for the applied study component one year in advance of the anticipated time of entry of the applied study. A minimum of 4 quarters would be required for completion. Students register as special students in the basic college, and tuition is the same as that charged for all basic college medical laboratory science professional courses.

MEDICAL LABORATORY SCIENCE—HEMATOLOGY**Bachelor of Science Degree****The Profession**

Hematology is a specialty in the broader field of medical laboratory science. Hematology technologists may be employed in hospitals and clinical laboratories where they perform specific laboratory tests—including differential cell counts, bone marrow examinations, and other complex hematologic determinations—which aid in the diagnosis, treatment, and follow-up of infections, anemias, and leukemias. The hematology technologist may also perform coagulation studies which aid the diagnosis and treatment of bleeding disorders and the treatment of patients on anti-coagulant therapy. The modern hematology laboratory is usually well equipped with electronic instruments which the technologist must operate and maintain. Additional responsibilities may include laboratory quality control and associated problem solving.

The current requirements for categorical certification in hematology are indicated by the Board of Registry of the American Society of Clinical Pathologists as follows:

A candidate for certification in hematology must meet at least one of the following requirements:

1. Certification in Medical Technology by the Board of Registry of the American Society of Clinical Pathologists with a baccalaureate degree from an accredited institution, plus one year of satisfactory hematology experience in an acceptable laboratory within the three years immediately prior to application.

2. A baccalaureate degree in biological sciences or chemistry from a college or university accredited by a recognized regional accrediting agency plus two years of hematology experience in an acceptable laboratory.

Students should contact the American Society of Clinical Pathologists, Board of Registry, P.O. Box 4872, Chicago, Illinois 60680, for details concerning their eligibility to write the hematology examination.

The curriculum in hematology does not incorporate a clinical or applied study component, but is primarily designed for those who work in this field, giving them the opportunity to earn a baccalaureate degree with a concentration in the area of interest.

The Medical Laboratory Science Professional Courses, numbered in the 87.100 and 87.200 series, will be offered directly through the College of Pharmacy and Allied Health Professions. Students must register as Special Students of that basic college and tuition will be the same as that charged for all basic college Medical Laboratory Science Professional Courses.

HEMATOLOGY**Bachelor of Science Degree****Required Courses:****quarter hours****Biology**

18.411,	18.412,	18.413	Biology I, II, III	12
18.424,	18.425,	18.426	Human Anatomy and Physiology	9
18.421,	18.422		Microbiology I, II	6
18.457,	18.458,	18.459	Genetics I, II and Lab	8
18.431,	18.432,	18.433	Cell Biology	8

Math

10.307,	10.308		College Algebra and Trig. I, II	8
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Chemistry

12.444,	12.445,	12.446	General Chemistry I, II, III	9
**12.427			Analytical Chemistry	4
or			or	
12.421,	12.422,	12.423	Analytical Chemistry I, II, III	9
12.431,	12.432,	12.433	Organic Chemistry I, II, III	12

Physics

11.304,	11.305,	11.306	General Physics I, II, III	6
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English

30.305,	30.306,	30.307	English I, II, III	9
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Medical Laboratory Science

87.300			MLS Orientation (to be taken if not working in the field)	2
87.101*			Basic MLS	4
87.102*			Basic Hematology	2
87.103*			Basic Immunohematology	2
87.105*			Basic Clinical Chemistry	4
87.190*			Undergraduate Research	2
87.203*			Immunology-Serology (Intensive)	2
87.204*			Parasitology (Intensive)	2
87.211*			Coagulation	2
87.213*			Immunohematology	2
87.222*			Histochemistry	2
87.302			Basic MLS Electronics & Instrumentation	2
87.311,	87.312		Morphologic Hematology I, II	6
87.369,	87.370		Health Science Education	6
87.301			Quality Control	3

Health Related

86.306			Hospital Law and Ethics	3
86.333,	86.334		Medical Care and Current Social Problems	6
86.307,	86.308		Hospital Organization and Management I, II	5

* Day school tuition

** Summer Intensive

Electives

Humanities	9
Social Science	9
Free electives	18

Strongly recommended electives are:

Histology
Psychology
Economics
Sociology
Statistics
Hematology
Computer Course
Total credits

MEDICAL LABORATORY SCIENCE—CYTOTECHNOLOGY**Associate in Science Degree****The Profession**

Cytotechnology is a specialty in the broader field of medical laboratory science. Cytotechnologists are normally employed in pathology laboratories, where they expertly examine slides of cells looking for minute abnormalities which are the early warning signs of cancer and related disease. Cytotechnology occupies an important place in clinical medicine, requiring a technologist with specialized laboratory training and a sound academic background.

The program, offered through University College and conducted in affiliation with the several hospitals which comprise the Boston School of Cytotechnology, leads to the Associate in Science, which is awarded by University College. Completion of the program qualifies a student for admission to the professional examination conducted by the Board of Registry of the American Society of Clinical Pathologists.

The basic sciences and the general education courses are offered evenings, but the professional courses are offered only full-time, days, in cooperation with the affiliated hospitals. Students planning to enter the professional courses are advised to consult the program coordinator prior to the Winter Quarter preceding entrance to the hospital program.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331).

Associate in Science—Cytotechnology

				quarter hours
Biology				
18.411,	18.412,	18.413	Biology I, II, III	12
18.424,	18.425,	18.426	Human Anatomy and Physiology	9
18.451,	18.452,	18.453	Histology—Organology I, II, III	6
18.421			Microbiology	3
Chemistry				
12.444,	12.445,	12.446	General Chemistry I, II, III	9
Mathematics				
10.307,	10.308		College Algebra and Trigonometry	8
Medical Laboratory Science				
87.300			Medical Laboratory Science Orientation	2
*87.101			Basic Medical Laboratory Science	4
*87.102			Basic MLS Hematology	2

* For information relative to special tuition rates for these courses, call 437-3321.

Health Related

86.333, 86.334	Medical Care and Current Social Problems I, II	6
86.306	Hospital Law and Ethics	3

Humanities

30.305, 30.306, 30.307	English I, II, III	9
	Social Science or Humanities electives	12

At the completion of 90 quarter hours of the above courses, a student is eligible for Cytotechnology Practicum at an AMA-approved Hospital School of Cytotechnology. This is a twelve month full time day certificate program. A special tuition rate of \$75 per credit applies to the following courses:

87.508	Introduction to Cytotechnology	2
87.528, 87.538, 87.558	Cytopathology I, II, III	6
87.568	Cytogenetics and New Concepts	2
87.598	Special Topics	2
87.608	Seminar: Cytopathology Criteria and Correlations	2
87.518, 87.548, 87.578, 87.618	Applied Cytology I, II, III, IV	14
Total credits		113

RADIOLOGIC TECHNOLOGY

The program in Radiologic Technology is a joint offering of the University and several area hospitals. The classroom experiences are provided by the University, and the Laboratory Practicum is conducted at an assigned affiliated hospital. The Program is accredited by the Council on Medical Education of the American Medical Association.

The Radiologic Technologist is a respected member of the allied health team in the diagnostic and therapeutic environment of the clinic or hospital, and an important functionary in the production, quality control, and inspection laboratories of the industrial community. Medically-related responsibilities demand effective rapport with internists, surgeons, pathologists, nurses, and laboratory personnel while industrial competency requires close association with metallurgists, production and manufacturing specialists, engineers, and scientists.

Prerequisite: Candidates must have satisfactorily passed three years of Math (Algebra I, Algebra II, and Geometry), one year of Biology, and one year of an additional science (Chemistry or Physics), at the high school level. In addition, applicants must satisfy general University requirements, and complete the University's Mathematics Placement Test satisfactorily. Candidates successfully meeting the above requirements will be scheduled for an interview with the Radiologic Technology Program Director.

Full-Time Day Programs

Certificate Program

quarter hours

FIRST YEAR

86.420,	86.421	Radiologic Technology Orientation I and II	6
86.422,	86.423	Radiologic Science I, II	8
86.424,	86.425	Principles of Radiology I, II	8
86.426,	86.427	Radiologic Photography and Exposure I, II	8
18.407,	18.408	Gross Anatomy and General Physiology I, II	6
10.527,	10.528	Mathematics I, II	6
30.305,	30.306,	English I, II	6

SECOND YEAR

86.447—	86.450	Radiology Practicum I, II, III, IV	12
		Clinical: (2400 hours at assigned affiliate hospital)	—
		Total Certificate	60

The above program (24 months) is a full-time day division of University College.

All graduates are eligible for certification by the American Registry of Radiologic Technologists.

Associate in Science Degree

FIRST YEAR			quarter hours	
86.420,	86.421	Radiologic Technology Orientation I, II	6	
86.422,	86.423	Radiologic Science I, II	8	
86.424,	86.425	Principles of Radiology I, II	8	
86.426,	86.427	Radiologic Photography and Exposure I, II	8	
10.527,	10.528,	10.529	Mathematics I, II, III	9
18.407,	18.408	Gross Anatomy and General Physiology I, II	6	
18.411		Biology I	4	
30.305,	30.306	English I, II	6	
86.447		Radiology Practicum I	3	
SECOND YEAR				
30.307		English III	3	
18.412,	18.413	Biology II, III	8	
86.434,	86.435	Advanced Radiologic Technology I, II	6	
45.452,	45.453	Management and Organization I, II	6	
21.301,	21.302	Sociology I, II		
	or	or		
19.301,	19.302	Psychology I, II	6	
86.436		Radioactive Isotopes	3	
86.437		Radiation Therapy	3	
86.448,	86.449,	86.450	Radiology Practicum II, III, IV	9
Total Credits			102	

Above program (28 months) is a full-time day division of University College.

All graduates are eligible for certification by the American Registry of Radiologic Technologists.

EVENING PROGRAM**Associate in Science Degree**

Candidates who wish to qualify for admission to University College for an Associate Degree in Science in Radiologic Technology must be certified by the American Registry of Radiologic Technology. Such certification shall be deemed as having completed the courses in the core program of the Certificate in Radiologic Technology.

Curriculum

Core Curriculum of Certificate program, except English and Math; include Radiology Practicum (12 q.h.). 48 q.h.

Prerequisite: Satisfactory completion of the above program via certificate or registration by the American Registry of Radiologic Technologists.

Completion of the following courses is required for Associate in Science Degree.

				quarter hours
10.527,	10.528,	10.529	Mathematics I, II, III	9
30.305,	30.306,	30.307	English I, II, III	9
18.411,	18.412,	18.413	Biology I, II, III	12
45.301,	45.302		Management and Organization I, II	6
21.301,	21.302		Sociology I, II	
	or		or	
19.301,	19.302		Psychology I, II	6
86.434,	86.435		Advanced Radiologic Technology I, II	6
86.436			Radioactive Isotopes	3
86.437			Radiation Therapy	3
Total Credits				<hr/> 102

education

GENERAL OBJECTIVES

The teacher education program in University College is deeply concerned with the quality of those who teach. In the paragraphs that follow, quality is generally described and the several ways of assessing it are outlined.

Objective I: *Every teacher should be broadly educated.*

All students are expected to develop breadth in their program in two ways. First, students will be required to complete certain common course work: social science, United States history, American literature, effective speaking, human development, and English. Second, all students must complete a minimum of 16 credits in each of the following areas: science and mathematics, humanities, and social sciences.

Objective II: *Every teacher should achieve an expertness in some field of knowledge.*

The Teacher Education Program in University College offers an academic major in the field of English. The major is designed to prepare English teachers for the junior or senior high school. It will also provide a basis for specialized graduate study in English as well as in education.

Objective III: *Each teacher should be professionally prepared for the position of his or her choice.*

In addition to their general education and specialized concentration, all students will share some common professional course work with related out-of-class experience and, in addition, will take course work appropriate to their level or field of teaching. Student teaching during the senior year will serve as an opportunity to apply what has been learned in the previous years. Beginning students will have about two years to estimate their abilities to master college work, to discover the wisdom of their choice of a major field, and to evaluate the strength of their commitment to, and qualifications for, teaching.

Admission Requirements

Important to the future teacher is strong ability in the communication skills and adequate strength in the field of special interest. As important as the pattern and quality of an applicant's preparation are the personal qualifications which contribute to success in teaching.

Upon completion of all courses (or their equivalent) listed under Quarters 1 - 6 on p. 138, students desiring certification must apply to the College of Education* for admission to the professional sequence of the teacher education program. They will be expected to present such evidence as the College of Education shall require. Evaluations will be made on academic

*One of the Basic (day) Colleges of Northeastern University.

aptitude, verbal fluency, interest in working with young people, and emotional maturity. A serious attempt will be made to assess these factors in their interrelationships rather than as isolated phenomena. Students accepted into the professional sequence of the College of Education will be expected to commit themselves to the remaining requirements of the program.

Transfers

Students admitted to advanced standing in University College (see p. 28) may apply for admission to the professional sequence on the basis of satisfactory grades received in courses which are the equivalent of those required for entering Quarter 7 (see p. 139). Credit toward electives may be earned by means of the College Level Examination Program or Proficiency Examination Program (PEP) (see p. 29).

GRADUATION REQUIREMENTS

Degrees

University College will award the degree of Bachelor of Science to those who successfully complete the program of preparation for teaching English at the secondary school level.

Quantitative Requirements

The required courses in the curriculum for the teaching of English are listed on a following page. The curriculum requires not less than 176 quarter hours of class work, including one quarter of student teaching. At least 52 quarter hours will be required in education, including student teaching.

Elective Courses

Elective courses, approved by the College of Education adviser, will be selected by the student from among courses in University College, or credit may be earned by means of the College Level Examination Program.

Qualitative Requirements

Students in the Teacher Education Program in University College will be expected to maintain an overall average of C while doing work of C+ or better in the field of specialization and in the professional sequence in order to be recommended for placement. Students are warned that any failure seriously handicaps their records and must be made up at the earliest opportunity.

Graduation with Honor

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

National Teacher Examinations

All students who plan to make teaching their career will be expected to take the general and special National Teacher Examinations in their senior year.

Programs of Instruction

The teacher education program in University College offers an academic major in the field of English (in grades 7-12). A specimen program is shown on the following page.

Accreditation

Northeastern University's College of Education is accredited by the National Council for Accreditation of Teacher Education. The College is a member of the American Association of Colleges for Teacher Education.

SPECIMEN PROGRAM IN TEACHING OF ENGLISH (GRADES 7-12)

This program is designed with the assumption that the student is attending college on approximately a half-time basis.

First Year

QUARTER 1

No.	Course	Cl.	q.h.
23.301	Hist. of Civ. I	3	3
29.301	Eff. Spkg. I	3	3
30.305	English I*	3	3

QUARTER 2

23.302	Hist. of Civ. II	3	3
29.302	Eff. Spkg. II	3	3
30.306	English II	3	3

QUARTER 3

23.303	Hist. of Civ. III	3	3
29.303	Eff. Spkg. III	3	3
30.307	English III	3	3

Second Year

QUARTER 4

No.	Course	Cl.	q.h.
	English Elective	3	3
50.114	Educ. & Soc. Sci.	4	4**

QUARTER 5

	English Elective	3	3
50.16-	Educ. Elective	4	4**

QUARTER 6

	English Elective	3	3
50.16-	Educ. Elective	4	4**

—	21
27	—
Total Credits	48

Students desiring certification must now apply to the College of Education*** for admission to the teacher education program.

* An English placement examination must be taken. If the score is not satisfactory, students should enroll in 30.304, Elements of Writing, a 3 q.h. credit course designed to improve command of written English. Then proceed with 30.305 etc. as indicated.

** Select two 50.16- courses, and one 50.13- and 50.15- course for, respectively, Quarters 5, 6, 10, 19, from among the following: 50.161, 50.163-50.168; 50.132-50.139; 50.152-50.154. (See Day College catalog for course descriptions.)

*** One of the Basic (day) Colleges of Northeastern University.

Third Year**QUARTER 7**

No.	Course	Cl.	q.h.
23.327	England 500-1603	3	3
26.301	Intro. Phil. I	3	3
39.301	Ec. Prin. & Prob. I	3	3

QUARTER 8

23.348	England 1603-1815	3	3
26.302	Intro. Phil. II	3	3
39.302	Ec. Prin. & Prob. II	3	3

QUARTER 9

23.349	England Since 1815	3	3
26.303	Intro. Phil. III	3	3
39.303	Ec. Prin. & Prob. III	3	3

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27**Fifth Year****QUARTER 13**

30.341	Eng. Lit. I	3	3
51.135	Anal. Tchng. & Ed. Proc.	4	4

QUARTER 14

30.342	Eng. Lit. II Electives	3	3
		4	4

QUARTER 15

30.343	Eng. Lit. III	3	3
51.126	Sec. Reading	4	4

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21**Fourth Year****QUARTER 10**

No.	Course	Cl.	q.h.
30.320	Eng. Lang.	3	3
50.13-	Educ. Elec.	4	4**

QUARTER 11

26.334	Logic	3	3
30.321	Linguistics	3	3

QUARTER 12

No.	Course	Cl.	q.h.
30.322	Semantics	3	3
50.131	Human Dev. & Learn. II	4	4

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20**Sixth Year****QUARTER 16**

30.317	Creat. Writ. I, Fiction	3	3
30.344	Am. Lit. I	3	3
50.141	Meas. & Eval.	4	4

QUARTER 17

30.318	Creat. Writ. II, Poetry	3	3
30.345	Amer. Lit. II Electives	3	3
		4	4

QUARTER 18

30.319	Creat. Writ. III, Wkshp.	3	3
30.346	Amer. Lit. III Electives	3	3
		4	4

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30

** Select two 50.16- courses, and one 50.13- and 50.15- course for, respectively, Quarters 5, 6, 10, 19, from among the following: 50.161, 50.163-50.168; 50.132-50.139; 50.152-50.154. (See Day College catalog for course descriptions.)

Seventh Year

QUARTER 19

	Art, Music,		
	Thea. Elec.	3	3
50.15-	Educ. Elec.	4	4**

QUARTER 20

	Art, Music,		
	Thea. Elec.	3	3
51.143	M&M-English	8	8

QUARTER 21

Electives	4	4
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22

Eighth Year

QUARTER 22

51.151	Student Teaching	8
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Total Credits

—
8
176

** Select two 50.16- courses, and one 50.13- and 50.15- course for, respectively, Quarters 5, 6, 10, 19, from among the following: 50.161, 50.163-50.168; 50.132-50.139; 50.152-50.154. (See Day College catalog for course descriptions.)



therapeutic recreation services

As Practiced in Nursing Homes, Hospitals,
Rehabilitation Centers, and Community Institutions

Prof. Frank Robinson, Consultant
Therapeutic Recreation Services
Telephone 437-3157

Therapeutic Recreation, which is concerned with the revitalization of the mind, spirit, and skills of people institutionalized in health care facilities, has emerged as an important part of the team concept in human services.

The certificate*** and Associate Degree programs in University College include individual case studies, group dynamics, motivational techniques as well as field practicum experiences.

CURRICULUM

I. Certification—35 quarter hours		
	Required professional courses	15 q.h.
	Required practicum	8 q.h.
	Required skill electives	6 q.h.
	Required professional electives	6 q.h.
II. Associate Degree—95 quarter hours		
	Required professional courses	18 q.h.
	Required practicum	8 q.h.
	Required professional electives	24 q.h.
	Required core courses	45 q.h.

Activity Leader Certificate Program

			quarter hours
Professional Courses—required			
63.301, 63.302, 63.303	Principles and Practices of Therapeutic Recreation I, II, III		9
63.304, 63.305	Group Dynamics and Leadership I, II		6
*63.310, 63.311	Field Practicum in Therapeutic Recreation I, II or		8
or			
**63.315, 63.316	Independent Study		—
			23

* See course description for practicum prerequisites. The appropriateness of being given a practicum assignment will be determined by the Academic adviser. Petitions may be obtained in 203 Churchill Hall.

** Permission is required for this option.

*** The certificate represents the criteria set by the program's consultant for having attained a basic level of competence in this field. There is, however, no official licensing board for Therapeutic Recreation practitioners, and, therefore, the certificate does not have public standing.

Skill Electives—select 6 q.h. from the following:

63.321	Social Recreation	3	
63.322	Music Therapy	3	
63.323, 63.324	Arts and Crafts I, II	6	
63.326	Media Resources and Techniques	3	
63.327	Therapeutic Use of Dramatics	3	6
		<hr/>	

Professional Electives—select 6 q.h. from the following:

63.330	The Process of Aging	3	
63.331	The Nursing Home Experience	3	
63.332	Therapeutic Rec. Rehabilitation	3	
63.333	Therapeutic Recreation in Corrections	3	
63.334	Outdoor Recreation for the Handicapped	3	
63.335	Activity and Movement Analysis	3	
63.336	Mental Illness and Retardation	3	
63.337	Therapeutic Recreation in		
	Child Development	3	
63.340	Leisure Counseling	3	
63.341	Eclectic Approaches to Client Treatment	3	6
		<hr/>	
Total Credits			35

Associate in Science Degree**Required Professional Courses****quarter hours**

63.301, 63.302, 63.303	Principles and Practices of Therapeutic Recreation I, II, III	9	
63.304, 63.305	Group Dynamics and Leadership I, II	6	
63.335	Activity and Movement Analysis	3	
*63.310, 63.311 or	Field Practicum in Therapeutic Recreation I, II, or		
**63.315, 63.316	Independent Study	8	
		—	26

Skill and Professional Electives

Select 24 q.h. from Skill Electives listings and Professional
Electives listings in certificate program (above).

24**Required Core Courses**

19.301, 19.302, 19.303	Psychology I, II, III	9	
18.311, 18.312	Biology I, II	6	
18.324, 18.325, 18.326	Anatomy and Physiology I, II, III	9	
21.363	Social Gerontology	3	
30.305, 30.306, 30.307	English I, II, III	9	
86.300	Medical Terminology Survey	3	
86.303, 86.304	Foundations of Medical Science I, II	6	45
		—	
	Total credits		95

The Associate degree program in therapeutic recreation has been designed to accommodate students who elect to pursue a B.S. degree in Health Management. If interested, contact the program director at 437-2325.

* See course description for practicum prerequisites. The appropriateness of being given a practicum assignment will be determined by the academic adviser. Petitions may be obtained in 203 Churchill Hall.

** Permission is required for this option.

course descriptions

Not all the courses listed in this bulletin will be offered. A final list of those classes to be offered will be contained in the University College Schedule of Courses, which gives the hours, days, and location of classes. This schedule is issued prior to the Fall, Winter, Spring, and Summer Quarters.

Abbreviations

- Q.H. = Quarter Hours (credit earned)
Cl. = Hours required in class per week
Prereq. = Prerequisite

Course Number Changes

In the fall of 1977, University College changed from a two-credit curriculum to a three-credit curriculum; consequently, course numbers have been changed. The specifics of the changes are listed under each of the individual programs.

Conversion Booklet

A conversion booklet is available for present and former students showing how the changes affect your status in the program.

Note for Mathematics and Physics courses offered by Lincoln College: Tuition for all courses in Lincoln College is at the rate of \$46.00 per quarter hour of credit.

10—MATHEMATICS (Lincoln College)

Students intending to enroll in Mathematics 10.327 or 10.335 will be given a Mathematics Placement Test during the registration period. A satisfactory score on this test will entitle the student to enroll in course 10.327 or 10.335, while an unsatisfactory score will require that he or she enroll in the non-credit course 10.330 for additional preparation.

10.301 Introduction to Mathematics I (4 cl., non-credit)

A comprehensive review of high school algebra including: first degree equations, factoring, fractions, fractional equations, ratio and proportion, word problems, and concepts of plane geometry. *Prereq. none.*

10.302 Introduction to Mathematics II (4 cl., non-credit)

Algebraic operations with complex fractions, mixed expressions, proportions, square roots, radicals, quadratic equations, simultaneous equations, graphs, and fractional zero and negative exponents. The geometry of the right triangle, areas of polygons and circles, and loci problems. Basic slide rule operation. *Prereq. 10.301.*

10.303 Introduction to Mathematics (3 cl., non-credit)

An accelerated combination of 10.301 and 10.302. (Day Curriculum.)

10.307 College Algebra and Trigonometry I (4 cl., 4 q.h.)

Fundamental algebraic operations; complex numbers; radicals and exponents; functions; linear and quadratic equations; irrational equations; inequalities; variations; roots of polynomial equations. *Prereq. Math. Placement Test or 10.302.*

10.308 College Algebra and Trigonometry II (4 cl., 4 q.h.)

Logarithms; trigonometric functions of angles in degrees and radians; trigonometric identities and equations; right triangles; oblique triangles; complex numbers in trigonometric form; systems of equations; determinants. *Prereq. 10.307.*

10.316 Probability and Statistics I (2 cl., 2 q.h.)

Basic tools, e.g., sets, permutations, and combinations; probability and applications. *Prereq. 10.308 or 10.329 or 10.335.*

10.317 Probability and Statistics II (2 cl., 2 q.h.)

Descriptive statistics, frequency distributions and probability density functions, normal and other distributions. *Prereq. 10.316.*

10.318 Probability and Statistics III (2 cl., 2 q.h.)

Bivariate distributions, correlation, statistical inference, and estimation regression. *Prereq. 10.317.*

10.320 Calculus I (4 cl., 4 q.h.)

Plane analytic geometry. Differentiation of algebraic functions. Rate, motion, maximum and minimum problems. Derivatives of higher order. Curve sketching. Basics in functions, limits, and continuity. *Prereq. 10.308 or 10.329.*

10.321 Calculus II (2 cl., 2 q.h.)

Integration of algebraic functions. Integration and differentiation of logarithmic, exponential, and trigonometric terms. Calculations of areas, volumes, and length of arc by definite integrals. *Prereq. 10.320.*

10.322 Calculus III (2 cl., 2 q.h.)

Differentiation and integration of inverse trigonometric functions. Integration by parts, substitution, and tables. The Trapezoidal and Simpson Rules. The application of the differential and integral calculus to the Polar Coordinate System. Indeterminate forms. *Prereq. 10.321.*

10.323 Calculus IV (2 cl., 2 q.h.)

Vectors in the plane, vectors in three-dimensional space. Functions of more than one variable. Partial differentiation. Multiple integration. Infinite series. Taylor's and Maclaurin's Formula. *Prereq. 10.322.*

10.324 Differential Equations I (2 cl., 2 q.h.)

Vector analysis; matrices and linear algebra. *Prereq. 10.323.*

10.325 Differential Equations II (2 cl., 2 q.h.)

Ordinary differential equations—standard types of the first order; linear differential equations, especially with constant coefficients. Variation of parameters. *Prereq. 10.324.*

10.326 Differential Equations III (2 cl., 2 q.h.)

Series solutions of differential equations; Laplace transforms; Fourier series and orthogonal functions. *Prereq.* 10.325.

10.527 Mathematics I (3 q.h.)

Sets, number systems, methods and applications of algebra: fundamental operations, special products, factoring, operations with fractions, exponents, and radicals. *Prereq.* *Math Placement Test* or 10.302 or 10.331.

10.528 Mathematics II (3 q.h.)

Linear, fractional, and quadratic equations; functions, relations, and graphs; systems of equations and inequalities; matrices and determinants. *Prereq.* 10.527.

10.529 Mathematics III (3 q.h.)

Ratio, proportion, and variation; logarithms, progressions, mathematical induction, the binomial theorem, permutations and combinations, probability. *Prereq.* 10.528.

10.330 Basic Mathematics I (2 cl., non-credit)

A review of elementary algebra; algebraic expressions and operations, equations, word problems. *Prereq.* none.

10.331 Basic Mathematics II (2 cl., non-credit)

Further review; operations with polynomials, factoring, fractional expressions, word problems. *Prereq.* 10.330.

10.532 Mathematics for Business Management I (3 q.h.)

Topics in mathematics generally applicable to business management. Logic, set theory, probability for decisions under uncertainty; survey of mathematical models, linear models. *Prereq.* 10.529 or equivalent.

10.533 Mathematics for Business Management II (3 q.h.)

Business applications of statistics, mathematics of finance, linear programming, matrix algebra and applications. *Prereq.* 10.532.

10.534 Mathematics for Business Management III (3 q.h.)

Directed graph models, markov chains, theory of games, utility theory, statistical decision theory. *Prereq.* 10.533.

10.351 Advanced Mathematics I (Numerical Analysis) (2 cl., 2 q.h.)

Basic methods of numerical analysis—roots by iteration; approximating polynomials and interpolation; least squares fitting; numerical integration; approximate solution of ordinary differential equations—problems employing the electronic computer. *Prereq.* 09.353 and 10.326.

10.352 Advanced Mathematics II (2 cl., 2 q.h.)

Introduction to partial differential equations, boundary-value problems, Sturm-Liouville systems. *Prereq.* 10.351.

10.353 Advanced Mathematics III (2 cl., 2 q.h.)

Special topics in analysis. *Prereq.* 10.352.

10.361 Modern Algebra I (2 cl., 2 q.h.)

Sets; binary operations; mappings; rings, integers, fields; rationals; reals, bases for computer applications; Euclidean algorithm; primes. *Prereq.* 10.308, 10.529 or 10.335.

10.362 Modern Algebra II (2 cl., 2 q.h.)

Field of complex number; groups; subgroups; polynomial rings; homomorphisms; isomorphisms; ideals. *Prereq.* 10.361.

10.363 Modern Algebra III (2 cl., 2 q.h.)

Vector spaces; linear transformations; dependence, independence; dimension applications to engineering, science, and business. *Prereq.* 10.362.

10.364 Modern Applied Algebra (4 cl., 4 q.h.)

Introduces the language of abstract algebra to the following topics: graphs, finite state machines, programming languages, Boolean Algebra, lattices, coding for communication channels, and radar. Algebraic theory of linear systems. *Prereq.* 10.361, 10.362, and 10.363.

10.401 Foundations of Mathematics I (2 cl., 2 q.h.)**10.402 Foundations of Mathematics II** (2 cl., 2 q.h.)**10.403 Foundations of Mathematics III** (2 cl., 2 q.h.)**10.421 Calculus—A** (4 cl., 4 q.h.)

Applications of derivatives to curve-sketching; antidifferentiation; the definite integral, with applications; calculus of non-algebraic functions—logarithmic, exponential, and trigonometric. Calculus of inverse trigonometric functions; techniques of integration; polar coordinates; the conic sections; vectors in a plane; indeterminate forms, L'Hospital's Rule. *Prereq.* 10.320.

10.422 Calculus—B (3 cl., 4 q.h.)

Calculus of functions of several variables, partial differentiation, multiple integrals, infinite series. Vector analysis; matrices and linear algebra. *Prereq.* 10.421.

10.423 Differential Equations (4 cl., 4 q.h.)

Ordinary differential equations—standard types of the first order; linear differential equations, especially with constant coefficients; Laplace transforms, series solutions of differential equations. Fourier series and orthogonal functions. *Prereq.* 10.422.

11—PHYSICS (Lincoln College)

11.301 Introductory Physics I (4 cl., non-credit)

A survey of physical principles and theories related to field of mechanics. Emphasis is placed upon the solution of applied problems. *Prereq.* None.

11.302 Introductory Physics II (4 cl., non-credit)

Extension of principles in mechanics and introduction of concepts in heat, sound, light, electricity, and magnetism. *Prereq.* 11.301.

11.304 General Physics I (2 cl., 2 q.h.)

Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion; conservation laws of energy and momentum. *Prereq.* 10.527 or concurrently.

11.305 General Physics II (2 cl., 2 q.h.)

Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; properties of light; simple optical systems. *Prereq.* 11.304.

11.306 General Physics III (2 cl., 2 q.h.)

Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits. *Prereq.* 11.305.

12—CHEMISTRY

Consultant: Prof. K. Weiss, Chairman, Chemistry Dept. (L.A. College)

Course Coordinator: Prof. F. Boig (L.A. College)

12.407 Modern Chemistry I (Introduction to Inorganic Chemistry) (2 cl., 2.4 lab, 3 q.h.)

Fundamental ideas of matter and energy, chemical bonding, chemical energy, water and solutions, colloids, ionic reactions, oxidation and reduction, acidity, radioactivity, air and water pollution. All topics usually will be discussed from the viewpoint of recent developments. The laboratory deals with experiments related to the lecture material. *The required laboratory for this course is designated 12.607, Lab for 12.407, and generally meets on the same night. You must register also for this laboratory to receive credit for 12.407.* (Laboratory fee)

12.408 Modern Chemistry II (Introduction to Organic Chemistry) (2 cl., 2.4 lab, 3 q.h.)

Classes of organic compounds, including hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines, amides, and carbohydrates, including their relationship with modern biology. The laboratory deals with experiments related to the lecture material. *The required laboratory for this course is designated 12.608, Lab for 12.408, and generally meets on the same night. You must register also for this laboratory to receive credit for 12.408.* *Prereq.* 12.407 or equiv. (Laboratory fee)

12.409 Modern Chemistry III (Introduction to the Chemistry of Living Bodies) (2 cl., 2.4 lab, 3 q.h.)

Includes fats, proteins, enzymes, chemistry of digestion, and the chemical reactions of body fluids. The laboratory deals with experiments related to the lecture material. *The required laboratory for this course is designated 12.609, Lab for 12.409, and generally meets on the same night. You must register also for this laboratory to receive credit for 12.409.* *Prereq.* 12.408 or equiv. (Laboratory fee)

12.415 Biochemistry I (3 cl., 3 q.h.)

The first quarter of a three quarter sequence. The sequence will try to cover introduction to the biochemistry of the cell, including the occurrence, chemistry, and metabolism of carbohydrates, lipids, proteins, and nucleic acids. *Prereq.* 12.433 or equiv.

12.416 Biochemistry II (3 cl., 3 q.h.)

Continuation of Biochemistry I. *Prereq.* 12.415 or equiv.

12.417 Biochemistry III (3 cl., 3 q.h.)

Continuation of Biochemistry II. *Prereq.* 12.416 or equiv.

12.421 Analytical Chemistry I (2 cl., 2.4 lab, 3 q.h.)

Analytical procedures and techniques. Principles and practice of gravimetric methods of analysis. Laboratory work usually involves procedures and techniques of gravimetric analysis. *The required laboratory for this course is designated 12.621, Lab for 12.421, and generally meets on the same night. You must register also for this laboratory to receive credit for 12.421. Prereq.* 12.446 or equiv. (Laboratory fee)

12.422 Analytical Chemistry II (2 cl., 2.4 lab, 3 q.h.)

Principles and practice of titrimetric methods of analysis. The laboratory work usually involves the procedures and techniques of volumetric analysis. *The required laboratory for this course is designated 12.622, Lab for 12.422, and generally meets on the same night. You must register also for this laboratory to receive credit for 12.422. Prereq.* 12.421 or equiv. (Laboratory fee)

12.423 Analytical Chemistry III (2 cl., 2.4 lab, 3 q.h.)

Theories of spectrophotometry, chromatography, and selected electroanalytical methods. The laboratory usually involves instruments and procedures for electrometric and optical methods of chemical analysis. *The required laboratory for the course is designated 12.623, Lab for 12.423, and generally meets on the same night. You must register also for this laboratory to receive credit for 12.423. Prereq.* 12.422 or equiv. (Laboratory fee)

12.427 Analytical Chemistry (Lectures and laboratory, 4 q.h., summer quarter only.)

Survey of principles and theories of volumetric, gravimetric, and instrumental analysis. Application made in the laboratory with analyses of unknown samples. *The required laboratory for this course is designated 12.627, Lab for 12.427, and generally meets on a different night. You must register also for this laboratory to receive credit for 12.427. Prereq.* General Chemistry or equiv. (Laboratory fee)

12.431 Organic Chemistry I (2 cl., 4 lab and disc., 4 q.h.)

Nature of carbon in organic compounds. General principles of structure, nomenclature, preparation, uses, and reactions of aliphatic hydrocarbons: alkanes, alkenes, alkynes, dienes, cycloalkanes. Position and geometric isomerism. Introduction to free radical and ionic mechanisms of reactions. The laboratory generally deals with the preparation and properties of compounds discussed in lecture. *The required laboratory and discussion for this course is designated 12.631, Lab for 12.431, and generally meets on a different night. You must register also for this laboratory and discussion to receive credit for 12.431. Prereq.* 12.446 or equiv. (Laboratory fee)

12.432 Organic Chemistry II (2 cl., 4 lab and disc., 4 q.h.)

Structure of benzene, electrophilic aromatic substitution reactions. General principles of structure, nomenclature, preparation, uses, and reactions of the various types of organic compounds, including: alcohols, alkyl and aryl halides, ethers and epoxides, and carboxylic acids. Optical isomerism and introductory chemical kinetics will be discussed. The laboratory generally deals with the preparation and properties of compounds discussed. *The required laboratory and discussion for this course is designated 12.632, Lab for 12.432, and generally meets on a different night. You must register also for this laboratory and discussion to receive credit for 12.432. Prereq.* 12.431 or equiv. (Laboratory fee)

12.433 Organic Chemistry III (2 cl., 4 lab and disc., 4 q.h.)

Continuation of 12.432 with emphasis on the application of chemical conversions to synthetic problems. Functional derivatives of carboxylic acids, sulfonic acids and their derivatives, amines, diazonium compounds, phenols, aldehydes, and ketones. The laboratory generally deals with the preparation and properties of compounds discussed. *The required laboratory and discussion for this course is designated 12.633, Lab for 12.433, and generally meets on a different night. You must register also for this laboratory and discussion to receive credit for 12.433. Prereq. 12.432 or equiv.* (Laboratory fee)

12.441 Physical Chemistry I (3 cl., 3 q.h.)

Thermodynamics, thermochemistry, First and Second Laws, entropy and free energy in spontaneous processes. *Prereq. 10.323, 11.306, and 12.446 or equiv.*

12.442 Physical Chemistry II (3 cl., 3 q.h.)

Chemical equilibria, acids and bases, electrochemistry, colligative properties, phase diagrams, thermodynamics of multicomponent systems. Kinetic molecular theory. *Prereq. 12.441 or equiv.*

12.443 Physical Chemistry III (3 cl., 3 q.h.)

Kinetics, quantum chemistry, photochemistry. *Prereq. 12.442 or equiv.*

12.444 General Chemistry I (2 cl., 2.4 lab, 3 q.h.)

Fundamental concepts: symbols, formulas, equations, atomic weights, and calculations based on equations. Gases, liquids, solutions, and ionization. The laboratory generally deals with experiments related to the lectures. *The required laboratory for this course is designated 12.644, Lab for 12.444, and generally meets on the same night. You must register also for this laboratory to receive credit for 12.444. Prereq. 10.327 or equiv. (or taken concurrently). (Not open to those students with credit for 12.311 or 12.314.)* (Laboratory fee)

12.445 General Chemistry II (2 cl., 2.4 lab, 3 q.h.)

Atomic structure, bonding, and molecular structure. Oxidation and reduction reactions, equilibrium and kinetics. The laboratory generally deals with experiments related to the lectures. *The required laboratory for this course is designated 12.645, Lab for 12.445, and generally meets on the same night. You must register also for this laboratory to receive credit for 12.445. Prereq. 12.444 or equiv. (Not open to those students with credit for 12.312 or 12.315.)* (Laboratory fee)

12.446 General Chemistry III (2 cl., 2.4 lab, 3 q.h.)

Thermochemistry and electrochemistry. Acids, bases, and solubility product. Nuclear chemistry. Introductory organic chemistry and biochemistry. The laboratory usually deals with experiments related to the lectures. *The required laboratory for this course is designated 12.646, Lab for 12.446, and generally meets on the same night. You must register also for this laboratory to receive credit for 12.446. Prereq. 12.445 or equiv. (Not open to those students with credit for 12.313 or 12.316.)* (Laboratory fee)

12.450 Chemistry and the Environment (3 cl., 3 q.h.)

This course is designed to acquaint the non-science students with the chemical aspects of the environment. Topics discussed generally include: air and water pollu-

tion, nuclear fallout, radiation damage, the effects of pesticides, aerosols, food additives, etc., and their relationship to public health. The necessary foundation of chemical principles will be presented. *No prereq.*

12.451 Instrumental Analysis I (formerly Instrumental and Radiochemistry I) (3 cl., 3 q.h.)

Basic theory and instruments used in electrochemical analysis. Course generally includes such topics as electrode and cell potentials, potentiometric titrations, direct potentiometry (pH meters and specific ion electrodes), coulometry, polarography, amperometry, electrogravimetry, and conductivity. *Prereq. 12.423 or equiv.* (This course and 12.452 can serve as preparation for certain graduate courses.)

12.452 Instrumental Analysis II (formerly Instrumental and Radiochemistry II) (3 cl., 3 q.h.)

Basic theory and instruments used in spectrochemical analysis. Course generally includes such topics as electromagnetic spectrum, ultraviolet and visible spectrophotometry, infrared spectrophotometry, X-ray analysis, fluorescence and phosphorescence, emission spectrophotometry, absorption spectrophotometry, and chromatography. *Prereq. 12.451 or equiv.* (This course and 12.451 can serve as preparation for certain graduate courses.)

12.453 Radiochemistry (formerly Instrumental and Radiochemistry III) (3 cl., 3 q.h.)

Radioactivity and nuclear reactions; production and study of nuclear reactions; equations of radioactive decay; nuclear states and radioactive processes; interaction of radiation with matter; radiation detection and measurement; statistics of radioactivity measurements; techniques for the study of radionuclides; tracers in chemical applications; and nuclear energy. *Prereq. 12.452 or equiv.*

12.460 Chemistry Workshop (1.5 cl., 0 q.h., given twice weekly)

A discussion and problem-solving session which will help reinforce and reexamine the material covered in 12.444, 12.445, and 12.446. Content is programmed according to needs of the students, and the classes are small and informal.

16—EARTH SCIENCE

Consultant: Prof. D. Wilmarth, Earth Sciences (L.A. College)

16.301 Earth Sciences I (3 q.h.)

The fundamental components of the solid Earth and their modes of organization. The structure of the solid Earth, its mode of forming its crustal exterior. The role of the oceans in building and shaping the continental masses.

16.302 Earth Sciences II (3 q.h.)

The gaseous components of the fluid Earth. Their organization into masses, systems, and mass interaction. The long-range consequences of the fluid Earth's effects upon the solid Earth in the reshaping of landforms and the production of new land masses. *Prereq. 16.301 or equiv.*

16.303 Earth Sciences III (3 q.h.)

A study of the Earth as an object in space. The history of the Earth as identified in the solid materials of the Earth. The implications of the Earth's history for the other mem-

bers of the solar system. The solar system as a model for the universe. *Prereq.* 16.302 or equiv.

16.304 Earth Sciences (Intensive) (9 q.h.)

A composite of 16.301, 16.302, and 16.303, as a one-quarter course.

16.311 History of Ancient World Sciences and Technologies (3 q.h.)

An in-depth study of selected sciences and technologies characterizing the ancient world. Classes are a combination of lecture-discussion, seminars based upon independent research, and extensive outside reading. *No prereq.*

16.312 History of Modern World Sciences and Technologies (3 q.h.)

A continuation of 16.311, beginning with the period of the Western World Renaissance. Continues to the present with the implications of contemporary sciences and technologies for the immediate future. *Prereq.* 16.311 or equiv.

16.324 Principles of Geology I (3 q.h.)

A detailed analysis of the crustal components of the Earth, their modes of formation, and the forces involved in their shaping. The relationship of these factors to the structure and processes of the Earth's interior. *Prereq.* 16.303 or equiv. (Not open to students who have credit for 16.521.)

16.325 Principles of Geology II (3 q.h.)

The forces and processes involved in the alteration, transportation, and deposition of crustal materials; their effect on the Earth's landforms. The interactions of the oceans with the land masses. *Prereq.* 16.324 or equiv. (Not open to students who have credit for 16.521.)

16.326 Principles of Geology III (3 q.h.)

A detailed study of the sedimentary and radio-chemical deposits of the Earth. Their relevant contributions to understanding the history of the Earth. *Prereq.* 16.325 or equiv.

16.327 Descriptive Mineralogy (3 q.h.)

The significance of atomic structure to the crystalline forms of mineral materials. The forces and factors that are responsible for the formations of minerals in the rock materials of the Earth's crust. *Prereq.* 16.324 or equiv.

16.328 Igneous and Metamorphic Petrology (3 q.h.)

The details of volcanic factors that produce igneous rock types. The internal and external crustal forces and motions that re-form all previously existing rock types. *Prereq.* 16.327 or equiv.

16.329 Sedimentary Petrology (3 q.h.)

The processes and forces that provide the materials for sedimentary rock forms. The rock types that evolve with time and their stratigraphic significance. *Prereq.* 16.328 or equiv.

16.331 Principles of Oceanology I (3 q.h.)

In-depth study of the origin of the global ocean; the physical and chemical properties

of sea water; development of ocean currents and their effect on land masses of the world; problems of ocean pollution. *Prereq. 16.303 or equiv.*

16.332 Principles of Oceanology II (3 q.h.)

The habitat zones and organisms of the sea. Economic importance of marine resources for expanding world population. *Prereq. 16.331 or equiv.*

16.333 Principles of Oceanology III (3 q.h.)

Physiography and structure of ocean basins; marine geological processes and features; sedimentation, erosion, shorelines, and bottom topography; methods and techniques of marine geological explorations. *Prereq. 16.332 or equiv.*

16.334 Fisheries Oceanology I (3 q.h.)

Survey of commercially important marine organisms; life and distribution of commercially important seaweed, shellfish, and fishes; population dynamics and fishery potential of the world's oceans; analysis of fishery stocks and sea farming. *Prereq. 16.333 or equiv.*

16.335 Fisheries Oceanology II (3 q.h.)

Examination of fishery methods and techniques around the world; recent technological advancement. Commercial products and applications of marine organisms; special emphasis on marine products of commerce from the New England area. Chemical, industrial, and dietary applications of marine products. *Prereq. 16.334 or equiv.*

16.336 Marine Resources (3 q.h.)

Quantitative and qualitative consideration of energy from the marine environment: current technological developments in the use of tidal power, off-shore oil, natural gas, thermal and nuclear energy from the sea. Food resources of the sea; analysis of world marine food production; marine food technology, conservation, and mariculture. Coastal zone recreational resources: beaches, artificial fishing reefs; shore erosion; SCUBA, boating, sailing, angling, and surfing. *Prereq. 16.335 or equiv.*

16.341 Principles of Meteorology I (3 q.h.)

An in-depth study of the composition and structure of the atmosphere. The issue of the solar energy input and the physical consequences for the dynamics of the atmosphere. *Prereq. 16.303 or equiv.*

16.342 Principles of Meteorology II (3 q.h.)

The formation and behavior of air masses. Consideration of the interactions of air masses, the formation of fronts and storms. *Prereq. 16.341 or equiv.*

16.343 Principles of Meteorology III (3 q.h.)

The practices and procedures of weather reporting and forecasting. The formulation of weather maps. The historical weather record and its value for the studies of world climatology. *Prereq. 16.342 or equiv.*

16.351 Principles of Astronomy I (3 q.h.)

The nature and scope of astronomy; the geocentric universe; the heliocentric universe; celestial reference systems; time and the calendar; the sun-moon earth system; astronomical instruments. *Prereq. 16.303 or equiv.*

16.352 Principles of Astronomy II (3 q.h.)

The solar system; the inner planets; the outer minor planets; the outer major planets; the telescopic planets; the asteroid belt; meteors; comets; the sun as a source of energy and center of organization. *Prereq. 16.351 or equiv.*

16.353 Principles of Astronomy III (3 q.h.)

The triangulation of space; stellar population; star color and motion; star systems; stellar evolution; galaxies. *Prereq. 16.352 or equiv.*

16.354 Observational Astronomy (3 q.h.)

An introduction to the planets, stars, and constellations that are visible to the naked eye. Lectures, the planetarium, and actual viewing sessions are all used during the course. Primary emphasis will be placed on those stars and constellations easily seen from mid-northern latitudes. *No prereq.*

16.355 Solar System Astronomy (3 q.h.)

A detailed examination of the individual components of the solar system. Contemporary results from the space probes are used to reassess our understandings of the origin and development of the solar system. *Prereq. 16.353 or equiv.*

16.356 Celestial Astronomy I (3 q.h.)

An examination of the sun as a model star. Variations of characteristics in single stars, star systems, stellar populations. The H-R diagram and stellar evolution. The significance of radio astronomy for stellar structure and stellar evolution. *Prereq. 16.355 or equiv.*

16.357 Celestial Astronomy II (3 q.h.)

The structure and organization of the Milky Way galaxy. The nature of inter-stellar and inter-galactic space, quasars, pulsars, black holes; cosmology. *Prereq. 16.356 or equiv.*

16.361 Principles of Physical Geography I (3 q.h.)

Physical assessment of the Earth as a spheroid; relations with the sun; geographic grid; map projections; illumination of the globe; geographic time studies and moon-tide relationships. *Prereq. 16.303 or equiv.*

16.362 Principles of Physical Geography II (3 q.h.)

Physical weather elements: temperature, pressure, moisture; cyclonic storms; role of weather elements in world climate. *Prereq. 16.361 or equiv.*

16.363 Principles of Physical Geography III (3 q.h.)

The Earth's landforms, their formation and description; particular emphasis given to the agents of deposition and erosion; the volcano, the river, the glacier, and ocean waves. *Prereq. 16.362 or equiv.*

16.367 Human and Cultural Geography (3 q.h.)

Spatial analysis of people throughout the world, their culture, cultural landscapes, cultural history, and cultural ecology. Provides for an understanding of differences in world populations. *Prereq. 16.363 or equiv.*

16.368 Economic Geography (3 q.h.)

A study of the physical and biological assets of the Earth, their locations, prevalence, use, and significance for mankind. *Prereq. 16.367 or equiv.*

16.369 Urban Geography (3 q.h.)

In-depth analysis of historical and present structure of cities; comparative world urbanism trends; historic city growth patterns; morphology; site and situations; central place theories; external and internal relations; economic base. *Prereq. 16.368 or equiv.*

16.371 Principles of Conservation I (3 q.h.)

Philosophy of conservation; historical development of the conservation movement in the U.S. since 1900; interactions of economics and conservation practices. *Prereq. 16.303 or equiv.*

16.372 Principles of Conservation II (3 q.h.)

Problems relating to the supply, use, and management of major renewable natural resources: forests, soil, wildlife, and water. *Prereq. 16.371 or equiv.*

16.373 Principles of Conservation III (3 q.h.)

Application of the theories and techniques of conservation; problems of urban resources; air and water pollution; recreational resources; the availability of funds. *Prereq. 16.372 or equiv.*

16.374 Conservation and the Nation (3 q.h.)

In-depth study of the current practices and problems in our nation; mineral resources availability and allocation; energy resources; atmospheric, fresh and salt water pollution; wildlife and endangered species. *Prereq. 16.373 or equiv.*

16.375 Conservation and the Community (3 q.h.)

Examination of the conservation problems at the local level; identification of the problem; the factors involved; the dimension of the problem; the responsibility of the community. *Prereq. 16.374 or equiv.*

16.376 Conservation Management (3 q.h.)

Assessment of current practices of the local community; sources of knowledge and assistance among the populace; agencies available to the community; nature and scope of practices needed; practicality of community action. *Prereq. 16.375 or equiv.*

18—BIOLOGY

Consultant: Prof. H. Werntz, Chairman, Biology Dept. (L.A. College)

Course Coordinator: Prof. F. A. Rosenberg (L.A. College)

18.407 Gross Anatomy and General Physiology I (3 cl., 3 q.h.)

Fundamental concepts of living organisms; chemical and biological characteristics of cellular metabolism. The skeletal system and its appendages. General nomenclature, anatomical names, and terms. *Prereq. none.*

18.408 Gross Anatomy and General Physiology II (3 cl., 3 q.h.)

The systems of the body and the relationships between them. The structure and function of each. *Prereq.* 18.407 or equiv.

18.409 Gross Anatomy and General Physiology III (3 cl., 3 q.h.)

Continuation of 18.408. *Prereq.* 18.408 or equiv.

18.411 Biology I (General) (3 cl., 3 lab., 4 q.h.)

Universal properties and processes of living organisms; cellular composition and cellular activities; inheritance and cellular control. *The required laboratory for this course is designated 18.611, Lab for 18.411, and generally meets on a different night. You must register also for this laboratory to receive credit for 18.411. Prereq.* none. (Laboratory fee)

18.412 Biology II (Animal) (3 cl., 3 lab., 4 q.h.)

Functional anatomy of animal organ systems, their interactions and environmental relationships. *The required laboratory for this course is designated 18.612, Lab for 18.412, and generally meets on a different night. You must register also for this laboratory to receive credit for 18.412. Prereq.* 18.411 or equiv. (Laboratory fee)

18.413 Biology III (Animal) (3 cl., 3 lab., 4 q.h.)

Systematic comparative study of the structure and functions of animals. Diversity of animals considered from the standpoint of evolutionary adaptation. *The required laboratory for this course is designated 18.613, Lab for 18.413, and generally meets on a different night. You must register also for this laboratory to receive credit for 18.413. Prereq.* 18.412 or equiv. (Laboratory fee)

18.419 Plant Biology (3 cl., 3 lab., 4 q.h.)

Systematic study of the structure and function of plants, principally vascular plants. Survey of the plant-like protists and monerans. *The required laboratory for this course is designated 18.619, Lab for 18.419, and generally meets on a different night. You must register also for this laboratory to receive credit for 18.419. Prereq.* 18.411 or equiv. (Laboratory fee)

18.420 Medical Microbiology (2 cl., 4 lab., 4 q.h.)

Major characteristics of disease-producing organisms. *The required laboratory for this course is designated 18.620, Lab for 18.420, and generally meets on a different day. You must register also for this laboratory to receive credit for 18.420. Prereq.* A formal course or professional laboratory experience in bacteriology. (Laboratory fee)

18.421 Microbiology I (2 cl., 3 lab., 3 q.h.)

Morphology and biochemistry of the bacteria. *The required laboratory for this course is designated 18.621, Lab for 18.421, and generally meets on a different night. You must register also for this laboratory to receive credit for 18.421. Prereq.* 18.413 or equiv. (Laboratory fee)

18.422 Microbiology II (2 cl., 3 lab., 3 q.h.)

Survey of pathogenic microorganisms. *The required laboratory for this course is designated 18.622, Lab for 18.422, and generally meets on a different night. You must*

register also for this laboratory to receive credit for 18.422. Prereq. 18.421 or equiv. (Laboratory fee)

18.423 Microbiology III (2 cl., 3 lab., 3 q.h.)

Characteristics and role of microorganisms in the environment. *The required laboratory for this course is designated 18.623, Lab for 18.423, and generally meets on a different night. You must register also for this laboratory to receive credit for 18.423.* Prereq. 18.422 or equiv. (Laboratory fee)

18.424 Human Anatomy and Physiology I (2 cl., 2 lab., 3 q.h.)

Introduction to human anatomy; osteology; anatomy of the muscular system, respiratory system, digestive system, the vascular system, urogenital system. The laboratory generally includes a study of human bone and cat dissection. *The required laboratory for this course is designated 18.624, Lab for 18.424, and generally meets on the same night. You must register also for this laboratory to receive credit for 18.424.* Prereq. 18.413 or equiv. (Laboratory fee)

18.425 Human Anatomy and Physiology II (2 cl., 2 lab., 3 q.h.)

Principles of physiology and continuation of the study of human anatomy. The laboratory is mainly concerned with muscle physiology. *The required laboratory for this course is designated 18.625, Lab for 18.425, and generally meets on the same night. You must register also for this laboratory to receive credit for 18.425.* Prereq. 18.424 or equiv. (Laboratory fee)

18.426 Human Anatomy and Physiology III (2 cl., 2 lab., 3 q.h.)

Continuation of the principles of physiology. The anatomy and physiology of the nervous system, physiology of the endocrine system. The laboratory generally deals with the physiology of respiration and the physiology of blood. *The required laboratory for this course is designated 18.626, Lab for 18.426, and generally meets on the same night. You must register also for this laboratory to receive credit for 18.425.* Prereq. 18.425 or equiv. (Laboratory fee)

18.430 Horticulture (3 q.h.)

The study of the science and art of plants, stressing the use of plants in the home and community. *The required laboratory for this course is designated 18.630, Lab for 18.430, and generally meets on the same day. You must register for this laboratory to receive credit for 18.430.* Prereq. none. (Laboratory fee)

18.431 Cell Biology I (3 cl., 3 q.h.)

Chemical composition of cells, structure of cells and organelles, transport processes, cell motion and excitability, growth. Prereq. 18.413, 18.458, and 12.433 or equiv.

18.432 Cell Biology II (3 cl., 3 q.h.)

Cellular energy supply, enzyme function, respiration and metabolism, photosynthesis and other synthetic pathways, control of cellular process. Prereq. 18.431 or equiv.

18.433 Cell Biology Laboratory (4 lab., 2 q.h.)

Laboratory techniques in cell biology; microscopy; structure and chemical composition of cells; enzyme measurements; photosynthesis; respiration; active transport; growth. Each class session lasts longer than in 18.431 or 18.432. Prereq. 18.432 or equiv. (Laboratory fee)

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18.435 Advanced Horticulture (3 q.h.)

The advanced study of the art and science of using plants for home and community. Special emphasis will be accorded various philosophies involving plants and man. *The required laboratory for this course is designated 18.635, Lab for 18.435, and generally meets on the same day. You must register for this laboratory to receive credit for 18.435. Prereq. 18.430. (Laboratory fee)*

18.438 Immunology (2 cl., 4 lab., 4 q.h.)

Biological, chemical, and physical attributes of antigens and antibodies, together with their serological interactions. *The required laboratory for this course is designated 18.638, Lab for 18.438, and generally meets on a different day. You must register also for this laboratory to receive credit for 18.438. Prereq. 18.423, 12.433, or equiv. (Laboratory fee)*

18.451 Histology-Organology I (1 cl., 2 lab., 2 q.h.)

The morphology of cells and tissues. *The required laboratory for this course is designated 18.651, Lab for 18.451, and generally meets on the same night. You must register also for this laboratory to receive credit for 18.451. Prereq. 18.413 or equiv. (Laboratory fee)*

18.452 Histology-Organology II (1 cl., 2 lab., 2 q.h.)

The tissue components of the integumentary, digestive, and respiratory systems. *The required laboratory for this course is designated 18.652, Lab for 18.452, and generally meets on the same night. You must register also for this laboratory to receive credit for 18.452. Prereq. 18.451 or equiv. (Laboratory fee)*

18.453 Histology-Organology III (1 cl., 2 lab., 2 q.h.)

The tissue components of the cardiovascular, excretory, reproductive, and endocrine systems. *The required laboratory for this course is designated 18.653, Lab for 18.453, and generally meets on the same night. You must register also for this laboratory to receive credit for 18.453. Prereq. 18.452 or equiv. (Laboratory fee)*

18.457 Genetics I (3 cl., 3 q.h.)

Mitosis, meiosis, and mendelian genetics. *Prereq. 18.413 or equiv.*

18.458 Genetics II (3 cl., 3 q.h.)

Chromosome mapping, mutations, translocation, chromosomal aberrations. *Prereq. 18.457 or equiv.*

18.459 Genetics Laboratory (4 lab., 2 q.h.)

Laboratory exercises involving Principles of Mendelian inheritance, linkage, crossing-over. Classical genetics utilizing *Drosophila*; biochemical studies utilizing *Neurospora*. *Each class session lasts longer than in 18.457 or 18.458. Prereq. 18.458 or equiv. (Laboratory fee)*

18.461 Ecology I (3 cl., 3 q.h.)

Environmental factors. The soil system. Water. The atmosphere. Temperature, light, wind, pressure. The physico-chemical factors—CO₂ N and mineral nutrients. Habitat. Distribution of plants and animals in the world according to temperature and precipitation. *Prereq. 18.413 or equiv.*

18.462 Ecology II (3 cl., 3 q.h.)

The ecosystem. Ecological niche. The producers, consumers, and decomposers. The pond ecosystem, desert ecosystem, forest ecosystem, and seashore ecosystem. Energy cycle and efficiency of energy utilization. Mass, weight, and energy pyramids. *Prereq.* 18.461 or equiv.

18.463 Ecology III (3 cl., 3 q.h.)

Population ecology. Biotic community. Population growth. Relations between the species. Symbiosis. Competition. Predation. Succession. *Prereq.* 18.462 or equiv.

18.464 Man and His Biosphere I (3 cl., 3 q.h.)

An ecological analysis of the human situation and man's interaction with other organisms. The necessary foundation of biological principles will be presented.

18.465 Man and His Biosphere II (3 cl., 3 q.h.)

A continuation of 18.464. *Prereq.* 18.464 or equiv.

19—PSYCHOLOGY

Consultant: Prof. Harlan Lane, Chairman; Psychology Dept. (L.A. College)

Associate Consultant: Prof. Charles Karis; Psychology Dept. (L.A. College)

19.301 Psychology I (3 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning.

19.302 Psychology II (3 q.h.)

Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. *Prereq.* 19.301 or equiv.

19.303 Psychology III (3 q.h.)

Personality theory and measurement, behavior disorders, mental health, and psychotherapy. *Prereq.* 19.302 or equiv.

19.304 Statistics in Psychology I (3 q.h.)

Scales of measurement in psychological research, measures of central tendency, and variability. *Prereq.* 19.303 or equiv. (Recommended for psychology majors.)

19.305 Statistics in Psychology II (3 q.h.)

Measures of correlation, introduction to probability, and statistical distributions. *Prereq.* 19.304 or equiv.

19.306 Statistics in Psychology III (3 q.h.)

Parametric and non-parametric tests of significance, including chi square, t-test, F test, and simple analysis of variance. *Prereq.* 19.305.

Note: 19.304, 19.305, and 19.306 may not be taken in addition to Statistics (39.311, 39.312, 39.313).

19.307 Psychology (Intensive) (9 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurements and testing, and principles of animal and human learning. Principles

of sensory processing, perception, motivation and emotion, and social influences on behavior. Personality theory and measurements, behavior disorders, mental health, and psychotherapy. (Not open to students who have taken 19.301, 19.302, 19.303.)

19.308 Fundamentals of Psychology I (4 q.h.)

Basic concepts from most areas of psychological investigation, the experimental orientation to the study of behavior, including child development, individual differences, learning and social psychology. (Recommended for Psychology majors.) (Not open to students who have credit for 19.301, 19.302, 19.303.)

19.309 Fundamentals of Psychology II (4 q.h.)

The sensory basis of behavior, cognition, perception, motivation, emotions, normal and abnormal personality. (Recommended for Psychology majors.) *Prereq.* 19.308 or *equiv.* (Not open to students who have credit for 19.301, 19.302, 19.303.)

19.311 Developmental Psychology I (formerly Child Psychology I) (3 q.h.)

Genetic factors in development, biological, social, and intellectual development during preschool years; factors in psychological development during the middle-childhood years; psychological and physical changes during adolescence; attitudes toward peer groups and parental figures; vocational choice; and the determination of moral standards and values. *Prereq.* 19.309, 19.319, 19.303, or *equiv.* (It is highly recommended that 19.340 be completed prior to registration for this course.)

19.312 Developmental Psychology II (formerly Child Psychology II) (3 q.h.)

The behavioral examination of developmental abnormalities, as evidenced in mental retardation, childhood schizophrenia, child delinquency, hyperactivity, specific learning problems, and aging, is used to illuminate normal developmental processes. *Prereq.* 19.311 or *equiv.*

19.313 Developmental Psychology III (formerly Adolescent Psychology) (3 q.h.)

A continuation of 19.312. *Prereq.* 19.312 or *equiv.*

19.314 Personality I (3 q.h.)

A systematic study of the normal personality, its growth and development. Topics generally include environmental and constitutional contributions; assessment of personality research; and a survey of the major theories of personality. (Not open to students who have taken 19.521.) *Prereq.* 19.309, 19.319, or 19.303 or *equiv.*

19.315 Personality II (Laboratory) (3 q.h.)

Introduction to methods and areas of research in personality. Usually includes problems of measurement, behavioral and dynamic concepts, and a laboratory project. *Prereq.* 19.314 or *equiv.*

19.323 Motivation (3 q.h.)

Survey of the various aspects of motivation. Such areas as primary and secondary reinforcement, unconscious motivation, effectance motivation, and the assessment of motive will be considered.

19.324 Social Psychology I (3 q.h.)

The socialization process, social motives, interpersonal perception, group membership and structure. *Prereq.* 19.303 or *equiv.*

19.325 Social Psychology II (3 q.h.)

Attitudes, prejudice and ethnic relations, leadership, mass behavior and social movements, and the effects of mass media of communication. *Prereq.* 19.324 or *equiv.*

19.332 Industrial Psychology I (3 q.h.)

Psychology as applied to industry, including such topics as history, causation, selection and placement procedures, employee assessment, individual differences and their evaluation, and the place of psychological tests in industry. *Prereq.* 19.303 or *equiv.*

19.333 Industrial Psychology II (3 q.h.)

Personnel training and development, motivation and work, attitudes and job satisfaction, engineering psychology, human factors in accident causation. *Prereq.* 19.332 or *equiv.*

19.334 Industrial Psychology III (3 q.h.)

Supervision and leadership, morale, personnel counseling, the psychology of labor-management relations, human relations, and organizational behavior. *Prereq.* 19.333 or *equiv.*

19.336 Psychology of Thought (3 q.h.)

Psychological factors in intuition, imagination, problem-solving, information processing, and concept learning. *Prereq.* 19.303 or *equiv.*

19.337 Psychology of Language (3 q.h.)

The child's acquisition of language, verbal habits, the analysis and measurement of meaning, cultural determinants of linguistic behavior, communication processes, and recent research in psycholinguistics. *Prereq.* 19.303 or *equiv.*

19.338 Psychology of Learning I (3 q.h.)

Features the application of basic behavioral principles to behavioral development, behavior modification, language development, and programmed learning, and their relations to theoretical considerations in the learning process. *Prereq.* 19.303 or *equiv.*

19.340 Psychology of Learning II (Laboratory) (3 q.h.)

Through direct experience, students may gain proficiency in the laboratory analysis of behavior, and in evaluating common generalizations about human behavior. Students may design and perform experiments in animal and human learning, memory, decision processes, concept formation, and other topics of individual interest. *Prereq.* 19.338 or *equiv.*

19.341 Abnormal Psychology I (3 q.h.)

An introduction of the study of the etiology and dynamics of the abnormal personality. (Students should not take the Abnormal Psychology sequence if they have credit for 19.354, 19.355, Psychopathology I, II). *Prereq.* 19.303 or *equiv.*

19.342 Abnormal Psychology II (3 q.h.)

The symptomatology and treatment of the neuroses and psychoses. *Prereq.* 19.341 or *equiv.*

19.343 Abnormal Psychology III (3 q.h.)

Psychosomatic, psychopathic, and organic disorders; varieties of psychotherapy. *Prereq. 19.342 or equiv.*

19.344 Abnormal Psychology (Intensive) (9 q.h.)

Same as 19.341, 19.342, and 19.343. *Prereq. 19.303 or equiv.*

19.345 Psychological Therapies (3 q.h.)

A survey of techniques for treating deviant behavior, from classical psychoanalytical therapies through methods of behavior modification. *Prereq. 19.343 or 19.355 or equiv.*

19.349 Sensation and Perception I (3 q.h.)

An introduction to the nature of the perceptual world; the nature of object recognition and identification; spatial organization; contextual effects; learning and perception; and the influence of attitudinal, motivational, and personality factors on perception. *Prereq. 19.303 or equiv.*

19.350 Sensation and Perception II (Laboratory) (3 q.h.)

Students usually do laboratory experiments on seeing, hearing, touching, and tasting. Studies may include dark adaptation, loudness, binaural interaction, brightness constancy, two-point touch thresholds, information processing, and interactions between the senses. *Prereq. 19.349 or equiv.*

***19.354 Psychopathology I (4 q.h.)**

A detailed consideration of the major forms of psychopathology, including the neuroses, the psychoses, psychosomatic disorders, conduct disorders, sociopathy, and mental retardation. Each disorder is considered in terms of its diagnostic and symptomatic features, its etiology, and its remediation. The principle forms of therapy are surveyed, including psychotherapies, behavioral therapies, somatic therapies, and community mental health programs. (Students should not take the Psychopathology sequence if they have credit for 19.341, 19.342, 19.343, Abnormal Psychology I, II, III). *Prereq. 19.309 or equiv.*

***19.355 Psychopathology II (4 q.h.)**

Continuation of 19.354

19.360 Psychology of Women (3 q.h.)

The examination, in both historical and contemporary context, of the body of knowledge studying woman, her function in social roles, and her behavior as determined genetically, physiologically, and psychologically. The research implications, future life styles, roles, and contributions of women.

19.361 Scientific Foundations of Psychology I (formerly Historical Development of Psychology I) (3 q.h.)

Historical development of psychology from its philosophical beginnings. *Prereq. Two of the following: 19.315, 19.340, 19.350, 19.381.*

* Recommended for psychology and other liberal arts majors.

19.362 Scientific Foundations of Psychology II (formerly Historical Development of Psychology II) (3 q.h.)

Major schools of psychology which have influenced modern psychological research, including functionalism, behaviorism, Gestalt psychology, and psychoanalysis. *Prereq.* 19.361 or *equiv.*

19.371 Senior Seminar in Psychology (3 q.h.)

Small groups of students meet to discuss topics in psychology of mutual interest. Each seminar has a different flavor, depending upon the student group and faculty. *Prereq.* 19.362 or *equiv.*

19.372 American Sign Language I (4 q.h.)

American Sign Language I is the first of a four-course sequence in conversational American Sign Language, the fourth most used language in the United States. The course focuses on frequently used signs, basic grammar rules, use of facial expressions, and presents some information about deaf people and their culture.

19.373 American Sign Language II (4 q.h.)

American Sign Language II is the second course offered in conversational American Sign Language. The focus of this course is on building of receptive and expressive sign vocabulary, fingerspelling, use of the signing space, facial expression and body postures. *Prereq.* 19.372 or *consent of instructor.*

19.374 Sign Language Interpreting I (4 q.h.) (formerly American Sign Language III-Interpreting)

First of three-course sequence on theoretical and practical aspects of simultaneous interpreting of English to various forms of American Sign Language and vice-versa. Lectures, discussions, and role playings cover definitions, ethics, client-interpreter relations, linguistic considerations, mechanics, and special considerations for different interpreting settings. Laboratory exercises focus on development of skills for accurate and smooth interpreting. These are individually tailored to start at student's most comfortable speed and lead to 140 words per minute. *Prereq.* 19.377 or *permission of instructor.*

19.375 Sign Language Interpreting II (4 q.h.)

This second course continues the topics of the first course on a more advanced level. Increased laboratory work focuses on solidifying and increasing skills in simultaneous interpreting. *Prereq.* 19.374. or *equiv.*

19.376 Sign Language Interpreting III (4 q.h.)

This third course continues discussions on variations of the topics covered in the previous courses. Laboratory work finalizes the skill development, preparing the student for practicum in interpreting. *Prereq.* 19.375 or *equiv.*

19.377 Intermediate American Sign Language I (4 q.h.)

This American Sign Language course emphasizes mastery of the receptive and expressive skills, fingerspelling, vocabulary development, and more complex grammatical structures. *Prereq.* 19.373 or *consent of instructor.*

19.378 Intermediate American Sign Language II (4 q.h.)

This course consists of intensive work on expressive and receptive skills in stories, dialogues, and poems. In addition, the course will cover topics in socio-linguistics aspects of various forms of manual English and their relation to American Sign Language. *Prereq. 19.377 or consent of instructor.*

19.380 Physiological Psychology I (3 q.h.)

How nerves function and work together in the nervous system; how our sense organs provide the brain with information about the outside world; how the brain acts to produce external observable behavior; and how such psychological concepts as perception, learning, motivation arousal, and emotion may relate to nervous system activity. *Prereq. 19.309, 19.319, or 19.303, or equiv.*

19.381 Physiological Psychology II (Laboratory) (3 q.h.)

Laboratory experiments based on evolution of the nervous system, sensory and motor mechanisms, motivation and emotion, sleep, attention, and perception, learning, and memory. *Prereq. 19.380 or equiv.*

19.382 Practicum in Sign Language Interpreting I (4 q.h.)

Sixty hours of sign language observation and interpreting under supervision of interpreters or staff in various settings arranged with the instructor. Twenty-four hours of seminar will be held to discuss ethics, professional conduct, and other problems that arise in student assignments. This sequence is designed to assist the student in preparing for the Massachusetts Registry of Interpreters for the Deaf Certification Evaluation. *Prereq. 19.382 or equiv.*

19.383 Practicum in Sign Language Interpreting II (4 q.h.)

A continuation of 19.382 *Prereq. 19.382.*

19.384 Practicum in Sign Language Interpreting III (4 q.h.)

A continuation of 19.383. *Prereq. 19.383.*

19.385 Psych-Social Orientation to Deaf People (4 q.h.)

The status of deaf people as a linguistic and cultural minority group. It is designed to try to give both lay people and persons experienced with deaf people systematic understanding of the various communication methods and the concomitant oral-manual controversy, nature of sign language and its varieties, educational and historical treatment to deafness and sociological and cultural make-up of the deaf community.

19.388 Drugs and Behavior (3 q.h.)

The application of quantitative behavior techniques in animals and man, to determine the behavioral effects of pharmacological agents. A systematic survey of the experimental literature. *Prereq. 19.303 or equiv.*

19.389 Impact of Psychology on Society (3 q.h.)

A consideration of such recent developments as the uses of intelligence and aptitude tests; psychosurgery and electroconvulsive therapy; techniques of behavior modification and control; minority and women's rights movements; direct brain stimulation by implanted electrodes; use of psychoactive drugs; use of the lie detector machine; and the application of experimental techniques to humans. *Prereq. 19.303 or equiv.*

19.391 Honors Program I (4 q.h.)

Prereq. Approval of the Dean.

19.392 Honors Program II (4 q.h.)

Prereq. 19.391.

19.393 Honors Program III (4 q.h.)

Prereq. 19.392.

19.499 Field Work in Psychology (6 q.h.)

Refer to page 76 describing field work courses. (To be discussed with Department Consultant or Major Adviser prior to registration.)

20—ANTHROPOLOGY

Consultant: (See Sociology)

20.301 Anthropology I (formerly Introduction to Physical Anthropology) (3 q.h.)

An introduction to elements of physical anthropology, covering such subjects as: the primates, fossil humans and evolution, problems of heredity and genetics, race and racial classifications, the bases of cultural behavior. (Not open to students who have credit for 21.401.)

20.302 Anthropology II (formerly Cultural Anthropology I) (3 q.h.)

An introduction to socio-cultural anthropology. Examines the nature of language, and the cultural institutions of human groups with simple foraging and horticultural adaptations. *Prereq.* 20.301 or equiv. (Not open to students who have credit for 21.402.)

20.303 Anthropology III (formerly Cultural Anthropology II) (3 q.h.)

The institutions and cultures of technologically advanced societies and states. *Prereq.* 20.302 or equiv.

20.304 Anthropology (Intensive) (9 q.h.)

Same as 20.301, 20.302, and 20.303.

20.321 Individual and Culture (formerly Culture and Personality) (3 q.h.)

Cross-cultural comparisons of the socialization and enculturation of children and adults with respect to roles, values, and personality. Course may examine theories and methods used in psychological anthropology.

20.331 Social Organization of Non-State Societies (formerly Primitive Social Organization) (3 q.h.)

Detailed studies of the institutions of peoples with collecting-hunting and horticultural subsistence economies.

20.332 Religion in Cross-Cultural Perspective (formerly Primitive Religion) (3 q.h.)

Comparative analyses of the rituals, beliefs, and religious institutions of various human groups.

20.333 Culture Change (formerly Acculturation) (3 q.h.)

An examination of the processes occurring in situations involving culture contact, conquest or colonialism.

20.337 Anthropological Theory (3 q.h.)

History of the major orientations and philosophies in anthropology: evolutionist, culture area and historical approaches, and functional, structural, ecological, and cognitive modes of analysis.

20.341 Native North American Peoples (formerly North American Indians) (3 q.h.)

Examines the past and present circumstances of a number of native North American peoples.

20.344 African Peoples and Cultures (3 q.h.)

African geography, prehistory, and culture; the spectrum of societal complexity ranging from Mbuti egalitarianism to Ashanti federation and the problems of political, economic, and social change in contemporary Africa.

20.345 Ethnology of the Indian Sub-Continent (3 q.h.)

People and cultures of the South Asian sub-continent from Pakistan to Assam and the Himalayas to Ceylon, with particular attention to traditional tribal and peasant cultures.

20.346 Society in India (3 q.h.)

Family, kinship, and caste in India, with emphasis on an examination of change in modern times.

20.347 Latin American Peoples and Cultures (3 q.h.)

The tribal and peasant adaptations of native and Hispanic populations to changing conditions in Latin America.

20.348 Studying the Family Cross-Culturally (3 q.h.)

Kinship and family systems in a variety of cultural settings.

20.349 Folklore (3 q.h.)

Folklore, art, and song in various societies, and how it is studied. Contemporary American materials are examined.

20.350 Peasant Society and Culture (3 q.h.)

Analyses of representative case studies of traditional peasant cultures in the non-Western and Western world.

20.360 Language and Culture (3 q.h.)

The functions of language and other forms of communication in human society. An introduction to analyses of the relationship between patterns of communication and other aspects of culture.

20.401 Principles of Anthropology I (4 q.h.)

An introduction to elements of physical anthropology: primates, fossil humans and evolution, problems of heredity and genetics, race and racial classifications. Also may examine the nature of language and cultural adaptation. (Not open to students who have credit for 20.301 or 20.302.)

20.402 Principles of Anthropology II (4 q.h.)

Surveys the institutions of technologically simple non-Western societies, as well as those of technologically advanced societies and states. *Prereq.* 20.401 or equiv. (Not open to students who have credit for 20.302 or 20.303.)

20.499 Field Work in Anthropology (6 q.h.)

(Refer to page 76 describing field work courses)

To be arranged with a departmental field work adviser prior to registration. *Prereq.* Major in Sociology-Anthropology and completion of 15 credits in Anthropology. (Students may receive credit for only one departmental field work course. Credit for 20.499 precludes credit for 21.499. Students who are eligible for departmental Honors courses may take any combination of field work and Honors totaling three courses.)

21—SOCIOLOGY

Consultant: Prof. Lila Leibowitz, Sociology Dept. (L.A. College)

Coordinator: Prof. Marcia Garrett (L.A. College)

21.301 Sociology I (3 q.h.)

Basic concepts and theories relating to the study of humans as participants in group life with emphasis on social structure, culture, socialization, and the family. Course materials require competency in reading and writing skills. (Not open to students who have credit for 21.401.)

21.302 Sociology II (3 q.h.)

A continuation of Sociology I with major emphasis on primary groups, associations, social stratification, collective behavior, and population. Term papers or essays may be required. *Prereq.* 21.301 or equiv. (Not open to students who have credit for 21.401 or 21.402.)

21.303 Sociology III (3 q.h.)

A continuation of Sociology II emphasizing a critical analysis of American society with particular attention to problems of social, political, urban, and industrial change. *Prereq.* 21.302 or equiv. (Not open to students who have credit for 21.402.)

21.304 Sociology (Intensive) (9 q.h.)

Basic concepts and theories relating to the study of humans as participants in group life. Examines social structure, culture, socialization, the family, primary groups, associations, social stratification, collective behavior, population, and problems of social, political, urban, and industrial change. Term papers or essays may be required. (Not open to students who have taken 21.301, 21.302, 21.303.)

21.305 Drugs and Society (3 q.h.)

An introduction to the sociology of drugs. Examines social definitions of drugs, conditions of their use, and socialization into drug use. Considers deviant drug use and effects of social control on definitions and use. A range of licit and illicit drugs will be considered.

21.306 Sociology of Religion (3 q.h.)

An examination of the role of religious belief systems and institutions in classical and Western societies.

21.307 Sex in Society: The Study of Sex Roles (3 q.h.)

Analysis of historical and contemporary development in how men's and women's changing roles are related to the society-at-large.

21.308 Sociology of Literature (3 q.h.)

Sociological analyses of the contexts and content of literary productions, such as novels, song lyrics, sci-fi, and films.

21.309 Sociology of Socialist and Utopian Societies (formerly Sociology of Socialist Societies) (3 q.h.)

Examines alternative social orders, comparing the ideology, economy, social organization, polity, child care, sex roles, etc., of such groups as the Hutterites, Amish, Kibbutzniks, Shakers, and such modern socialist states as China, the Soviet Union, Cuba, etc.

21.312 Social Research Methods I: Generating and Investigating Research Problems (4 q.h.)

Methods for producing knowledge through social research will be examined. Emphasis will be placed upon the practical aspects of research, i.e., the problems that sociologists face in doing research and how they have solved these problems. Students will be required to design a small study.

21.313 Social Research Methods II: Tabulating and Analyzing Social Data (4 q.h.)

Methods of tabulating, presenting, summarizing and analyzing data. Students will be required to learn elementary descriptive and inferential statistics and how to use them. Statistics as a tool will be emphasized and students will be introduced to the use of the computer. *Prereq. 21.312 or equiv.*

21.314 Social Research Methods III: Doing Social Research (4 q.h.)

Students will be required to carry out the study they designed in Research Methods I, analyze data, and report results. The ethics and politics of social research will be discussed, as will relationships among social action, social research, and theory building. *Prereq. 21.313 or equiv.*

21.317 Social Theory I (formerly Foundations of Sociological Theory) (3 q.h.)

A historical survey of sociological theorists including the work of deTocqueville, Comte, Marx, Durkheim, Cooley, and others. *Prereq. Consent of the instructor or 12 q.h. in sociology-anthropology.*

21.318 Social Theory II (formerly Contemporary Sociological Theory I) (3 q.h.)

A study of major theoretical issues in sociology. Discussion concentrates on systematic questions and topics, as opposed to particular theorists, but material is drawn from theorists such as Weber, Simmel, Thomas, Mannheim, Merton, and Parsons. *Prereq. 21.317 or equiv.*

21.319 Social Theory III (formerly Contemporary Sociological Theory II) (3 q.h.)

A seminar in which the principal focus will be upon questions of theoretical interest, e.g. the problem of order, the problem of change, the role of the individual in change. Students will present papers in class. *Prereq. 21.318 or equiv.*

21.328 Social Stratification: Class, Status, and Power (3 q.h.)

A comparative study of the nature of class structure with emphasis on the United States. Discussion of such topics as theories of class structure, factors determining class membership, differential class behavior, and social mobility.

21.331 Social Change (3 q.h.)

An analysis of changing patterns in social and economic institutions and of modern social movements.

21.334 Social Control (3 q.h.)

The study of group membership as a determinant of behavior, analysis of status and role, patterns of authority, power, and group ideology as factors in the evaluation of conduct.

21.335 Political Sociology: Who Gets What (3 q.h.)

The social structure of political life emphasizing relationships in modern society between classes, occupations, racial and ethnic groups, etc. Examines how levels of opportunity affect political activities and institutions.

21.338 (see 25.338)

21.339 (see 25.339)

21.340 (see 25.340)

21.343 (see 25.343)

21.344 (see 25.344)

21.345 (see 25.345)

21.346 Sociology of Deviant Behavior (3 q.h.)

Analysis of a variety of social problems with relation to the organization of society. Particular attention will be given to alcoholism, sex offenses, drug abuse, mental disorder, and other responses to conditions of urban industrial society.

21.347 Social Problems (3 q.h.)

An overview of contemporary American social problems and the application of sociological concepts, methods, and principles to these problems.

21.350 Juvenile Delinquency (3 q.h.)

A study of factors in delinquency and an examination of their implications for prevention, rehabilitation, and treatment.

21.351 Family and Marriage I (3 q.h.)

A comparative and historical treatment stressing the past history and development of the family.

21.352 Family and Marriage II (3 q.h.)

A continuation of Family and Marriage I, emphasizing the backgrounds of contemporary problems in the context of functions, forms, and processes of this institution.

21.353 Intergroup Relations I (formerly Racial and Cultural Relations I) (3 q.h.)

A study of the relationships between various racial, national, cultural, and religious groups with emphasis on the historical development of black-white relationships in American society.

21.354 Intergroup Relations II (formerly Racial and Cultural Relations II) (3 q.h.)

A continuation of Intergroup Relations I, stressing the problems of contemporary minority peoples in American and other societies. *Prereq.* 21.353 or equiv.

21.356 Sociology of Inequality (formerly Sociology of Poverty) (3 q.h.)

An analysis of American class and ethnic differences in historical perspective, drawing on comparisons with other countries. Critical evaluation of sociological research and theories relating to the causes, effects, and societal responses to poverty. Suitable for students in applied fields, such as nursing, criminal justice, education, allied health, pre-med, and pre-law.

21.357 Urban Sociology (3 q.h.)

Analyses of the various causes, characteristics, and effects of urbanization in several different cultures. Specific attention is given to the problem of urban and suburban living and the changing structure of the city.

21.358 Community Analysis (3 q.h.)

Demographic and ecological theories of man's relation to his physical environment. Development of the concept of community and discussion of community study methods. Contrasts between rural communities and urban neighborhoods. Discussion and evaluation of community action programs.

21.359 Seminar in Urban Studies (3 q.h.)

Interdisciplinary approaches to analyses of urban issues, continuing student projects. *Prereq.* One previous course in urban studies field.

21.360 Medical Sociology (3 q.h.)

Sociological concepts and research relating to the study of patterns of behavior in the areas of health and disease. Emphasis on the family, community, medical organizations, class, and status as social sub-systems related to the field of health.

21.361 Sociology of Mental Health (3 q.h.)

Sociological aspects of mental health and mental disorder: the social history of mental illness, epidemiological and cross-cultural approaches to mental disorder, the career of the mental patient, the functions of psychiatry in society, community and social treatment modalities, and social psychiatry.

21.363 Social Gerontology: The Aged in Society (3 q.h.)

An examination of social factors involved in aging, with specific reference to how biological and psychological age changes influence behavior, social roles, and cultural patterns. The relation of aging to social change and special provisions for the elderly.

21.364 Sociology of Childhood (3 q.h.)

An examination in both historical and contemporary context of the economic, political, psychological, and social roles and functions of the child. Special attention is given to the current legal and social status of children.

21.365 Sociology of Education (3 q.h.)

The comparative study of formal and informal educational systems. Emphasis will be placed on the structures and functioning of educational institutions for the larger societies of which they are a part.

21.370 Sociology of Occupations and Professions (3 q.h.)

Analysis of the social relations within occupational groups of occupational structure and of institutional aspects of an occupation. Relationships between supervisors, peers, colleagues, subordinates, and clientele; their significance for work-role behavior.

21.373 Sociology of Industry (3 q.h.)

Comparison of pre-industrial and industrial society, stressing the impact of industry on society and the relationship between industry, culture, and values. Diversification, specialization, human relations, and formal and informal groups are dealt with.

21.375 Sociology of Formal Organizations: Humans, Machines and Bureaucracy (3 q.h.)

A study of formal organizations and the principles that govern organizational life. Weber's theory of bureaucracy and the concept of authority; communication systems and other conceptions of formal organizations. The structure of work groups and their effect on the larger organization.

21.391 Honors Program I (4 q.h.)

Prereq. 21.312, 21.313, 21.314 and 21.317, 21.318, 21.319, and approval of the Dean. (Students may take any combination of field work and Honors totaling three courses.)

21.392 Honors Program II (4 q.h.)

Prereq. 21.391

21.393 Honors Program III (4 q.h.)

Prereq. 21.392

21.401 Principles of Sociology I (recommended for Majors) (4 q.h.)

An introduction to basic concepts and theories relating to the study of humans as participants in group life. Emphasis is placed on socialization, culture, social structure, primary groups, family, social stratification, and population. (*Not open to students who have credit for 21.301 or 21.302.*)

21.402 Principles of Sociology II (4 q.h.)

A continuation of Principles of Sociology I with emphasis on a critical analysis of American society with particular attention to problems of social, political, urban, and industrial change. *Prereq. 21.401 or equiv. (Not open to students who have credit for 21.302 or 21.303.)*

21.417 Social Theory I (Intensive) (4 q.h.)

A historical survey of sociological theorists, including the work of de Tocqueville, Comte, Marx, Durkheim, Cooley, Weber, Simmel and others. *Prereq.* Consent of the instructor or 12 q.h. in sociology-anthropology. (Not open to students who have credit for 21.317, 21.318, or 21.319.)

21.418 Social Theory II (Intensive) (4 q.h.)

A study of the major theoretical issues in sociology. Discussion concentrates on systematic questions and topics, but material is drawn from theorists such as Mannheim, Merton, Parsons. Students may be required to present papers in class on questions of theoretical interest: e.g. the problem of order, the problem of change, the role of the individual in change, etc. *Prereq.* 21.417 or equiv. (Not open to students who have credit for 21.317, 21.318, or 21.319.)

21.499 Field Work in Sociology (6 q.h.)

Refer to page 76 describing field work courses.

To be arranged with a departmental field work adviser prior to registration. *Prereq.* Major in Sociology-Anthropology and completion of 15 credits in Sociology. (Students may receive credit for only one departmental field work course. Credit for 21.499 precludes credit for 20.499. Students who are eligible for departmental Honors courses may take any combination of field work and Honors totaling three courses.)

25—SOCIAL WELFARE

Course Coordinator: Prof. Lila Leibowitz, Sociology Dept. (L.A. College)

25.338 Introduction to Social Welfare I (3 q.h.)

An introduction to the nature and scope of the social welfare institution, its historical development, the effects of urban industrialization, and its relationship to present-day American Society.

25.339 Introduction to Social Welfare II (3 q.h.)

A continuation of Introduction to Social Welfare I, with particular attention to the development of social security and the welfare state.

25.340 Introduction to Social Welfare III (3 q.h.)

A continuation of Introduction to Social Welfare II, focusing on selected aspects of the current social welfare system, its attempts to alleviate poverty, and other social problems.

25.343 Introduction to Social Work Practice I (3 q.h.)

An introduction to the functions of the helping profession of social work, its settings and methods. Specific techniques such as interviewing, history taking, and recording skills are presented.

25.344 Introduction to Social Work Practice II (3 q.h.)

A continuation of Introduction to Social Work Practice I, with particular attention to the functioning of social workers in selected settings.

25.345 Introduction to Social Work Practice III (3 q.h.)

A continuation of Introduction to Social Work Practice II, with emphasis on enhancement of practice skills.

22—POLITICAL SCIENCE

Consultant: Prof. D. Schmitt, Chairman, Political Science Dept. (L.A. College)

Course Coordinator: Prof. Minton Goldman (L.A. College)

22.301 Principles of Political Science I (3 q.h.)

Evolution of the nation-state. Analysis of basic political concepts. Study of basic forms of the contemporary political system.

22.302 Principles of Political Science II (3 q.h.)

Analysis of constitutional and totalitarian models. Study of contemporary British and Soviet political systems. *Prereq.* 22.301 or equiv. or consent of instructor.

22.303 Principles of Political Science III (3 q.h.)

The American political system including study of civil rights. International politics and American foreign policy since 1945. *Prereq.* 22.302 or equiv. or consent of instructor.

22.304 Principles of Political Science (Intensive) (9 q.h.)

Evolution of the nation-state. Analysis of basic political concepts. Study of basic forms of the contemporary political system. Analysis of constitutional and totalitarian models. Study of contemporary British and Soviet political systems. The American political system including study of Civil Rights, International politics and American foreign policy since 1945. *(Not open to students who have taken 22.301, 22.302, 22.303, or equiv.)*

22.305 Contemporary Political Theory (3 q.h.)

Political ideas and systems of political thought from Machiavelli to the present. *Prereq.* 22.336 or equiv.

22.308 Research Methods (3 q.h.)

An introduction to some of the most common methods of carrying out research in the discipline of political science. Problems of theory construction, data-gathering, and a selection of analytical research tools including bibliographical aids and the computer are examined.

22.314 American Constitutional Law (3 q.h.)

A case analysis of the development of federalism, the separation of powers, and the role of the federal and state courts in constitutional development.

22.315 Civil Rights (3 q.h.)

An evaluation of the quality and content of civil liberties in the United States. Emphasis usually is placed on the first, fifth, sixth, fourteenth, and fifteenth amendments to the Constitution.

22.316 Public Administration I (3 q.h.)

An introduction to the theory, forms, and processes of administration at the national and state level.

22.317 Public Administration II (3 q.h.)

Selected problems. Case study approach to examination of relation between the theory and practice of public administration. *Prereq.* 22.316 or equiv.

22.318 Government and Politics of the States (3 q.h.)

A study of state and local government, problems, and the function and operational responses to them.

22.319 The Legislative Process (3 q.h.)

An institutional, functional analysis of the roles of Congress, the executive, and political parties in the legislative process.

22.320 The American Presidency (3 q.h.)

A multifaceted examination of the nation's Chief Executive: the presidential electoral process; the President's many constituencies; and the differing styles of various 20th-century Presidents. The constitutional and extra-constitutional powers of the office are some areas considered.

22.328 Procedural Due Process (3 q.h.)

A study of due process in the American Constitutional scheme.

22.329 Comparative Politics (Intensive) (4 q.h.)

A comparative analysis of political culture, organization and behavior in different national settings.

22.333 Formulating American Foreign Policy (3 q.h.)

The constitution and political instruments for the formulation of American foreign policy.

22.334 Soviet Foreign Policy (3 q.h.)

A study of the evolution of Soviet foreign policy since 1917 with emphasis on the development of the international Communist movement.

22.335 International Relations (4 q.h.)

Elements and limitations on national power. Contemporary world politics, problems of war and peaceful coexistence. (*Not to be taken by students who have credit for 22.531.*)

22.336 Introduction to Political Theory (4 q.h.)

Development of the political ideas of the Western world. The major philosophers of Greece, Rome, The Christian Era, and the Renaissance. *Prereq. 22.303 or equiv. (Not to be taken by students who have credit for 22.304.)*

22.341 International Law (3 q.h.)

A procedural and substantive study of legal relations among nation states.

22.342 American Foreign Policy I (3 q.h.)

Recent and current American foreign affairs.

22.343 American Foreign Policy II (3 q.h.)

Recent and current American foreign affairs, continued. *Prereq. 22.342 or equiv.*

22.344 Government and Politics in the Soviet Union I (3 q.h.)

An analysis of modern totalitarian theory and practice is followed by a study of the ideological and historical bases of the Soviet dictatorship. *Prereq. 22.329 or equiv.*

22.345 Government and Politics in the Soviet Union II (3 q.h.)

A continuation of 22.344. A study of the Soviet federalism, party and state organization, with special attention to the problems of political succession. *Prereq.* 22.344 or *equiv.*

22.351 Current Political Issues (3 q.h.)

A topical analysis of the constitutional and political basis of selected problems in American political life.

22.360 Politics and Policies of the Developing Nations I (3 q.h.)

Colonialism and the struggles for independence are discussed and the common problems of developing nations are analyzed. Topics may include economic development, urbanization, cultural fragmentation, and revolution. *Prereq.* 22.329 or *equiv.*

22.361 Politics and Policies of the Developing Nations II (3 q.h.)

Based on the foundation provided in Part I, this course deals with efforts of developing countries to achieve rapid social, economic, and political modernization. The frequency of military takeovers and the prevalence of corrupt, inefficient government bureaucracies are discussed. The democratic and authoritarian avenues toward development are compared and evaluated. *Prereq.* 22.360 or *equiv.*

22.370 Consumer Advocacy I (3 q.h.)

A pragmatic course designed to define and expand the role of consumers in the marketplace. It is intended to focus upon consumer issues which confront us daily, so that individuals may deal with them intelligently and effectively. While not designed to make students "consumer-lawyers," it will touch upon legal as well as social, economic, and political aspects of consumer problems.

22.371 Consumer Advocacy II (3 q.h.)

A continuation of 22.370. *Prereq.* 22.370 or *equiv.*

22.372 Consumer Advocacy III (3 q.h.)

A continuation of 22.371. *Prereq.* 22.371 or *equiv.*

22.391 Honors Program I (4 q.h.)

Prereq. Approval of the Dean.

22.392 Honors Program II (4 q.h.)

Prereq. 22.391.

22.393 Honors Program III (4 q.h.)

Prereq. 22.392.

22.401 Introduction to Political Science I (4 q.h.)

Basic political concepts and forces of organization from the classical Greeks to the modern nation-state. The Soviet Union and the United Kingdom are contrasted as contemporary illustrations of the institutional distinction between a totalitarian and constitutional system. (*Not open to students who intend to receive credit for 22.301, 22.302, 22.303.*)

22.402 Introduction to Political Science II (4 q.h.)

The development of operational liberty in the United States and its constitutional underpinnings are considered, together with an analysis of the national American political process and the conduct of recent American foreign relations. (*Not open to students who intend to receive credit for 22.301, 22.302, 22.303.*)

23—HISTORY

Consultant: Raymond H. Robinson, Chairman, Department of History, College of Liberal Arts

Coordinator of Western Civilization and Adviser to History Majors: Gerald H. Herman, Department of History, College of Liberal Arts

23.300 The Historian's Craft (3 q.h.)

The ways in which the historian studies the past with emphasis on research and writing.

23.301 History of Civilization I (3 q.h.)

A worldwide overview of the development of human institutions from evolution through the end of the European Middle Ages. Emphasis generally will be placed on the continuities and changes that occur within civilizations and on the similarities, differences, and relationships that exist among contemporary civilizations around the world. The course is taught with a view to drawing out the implications of each historical period for our lives today.

23.302 History of Civilization II (3 q.h.)

The age of transition to the early modern world emphasizing the intellectual, technological, and political expansion of Europe and the reactions of the rest of the world to that expansion. Special attention generally will be given to such topics as the rise of dynastic states, the rise and fall of mercantilism, the scientific revolution, exploration and gunpowder technology, and order and revolution. The period is from the end of the European Middle Ages to the coming of the French Revolution in 1789.

23.303 History of Civilization III (3 q.h.)

The modern world from 1789 to the present. Topics usually include capitalism and industrialization, nationalism and imperialism, the clash of ideologies in the nineteenth century, and a study of the present century of total war. Based on this historical study, the prospects for the future will be explored.

23.304 American History I (3 q.h.)

America from 1763 to 1848, with attention to the development of political, economic, and social institutions in the new republic.

23.305 American History II (3 q.h.)

The United States from 1848 to 1917, with attention to the coming of the Civil War, economic development thereafter, and the Progressive Era.

23.306 American History III (3 q.h.)

The United States since 1917, an age of urbanized industrialism and international involvement and crisis.

23.309 History of Civilization A (4 q.h.)

The major ideas and institutions of civilization from ancient times to 1648. *(Not open to students who intend to receive credit for 23.301 and/or 23.302.)*

23.310 History of Civilization B (4 q.h.)

A continuation of 23.309, covering the period since 1648. *(Not open to students who intend to receive credit for 23.302 and/or 23.303.)*

23.311 American History A (4 q.h.)

America from 1763 to 1877. *(Not open to students who intend to receive credit for 23.304 and/or 23.305.)*

23.312 American History B (4 q.h.)

The United States since 1877. *(Not open to students who intend to receive credit for 23.305 and/or 23.306.)*

23.315 Women in American History (3 q.h., Group III)

A historical examination of the position and role of women in American life.

23.316 Women in European History (3 q.h., Group II)

A historical examination of the position and role of women in European life.

23.317 European Urban History to 1750 (3 q.h., Group I)

European cities from ancient times to the age of industrialization.

23.318 European Urban History since 1750 (3 q.h., Group II)

The relationship of industrialization and urbanization in Europe from the mid-eighteenth century to the present.

23.320 Population in History (3 q.h., Group I or II)

An application of the principles of demography to European history from Roman times to the present.

23.321 Ancient Middle East (3 q.h., Group I)

A study of ancient cultures and peoples in the Middle East to the rise of Islam.

23.322 Ancient Greece (3 q.h., Group I)

The origin and development of Greek civilization.

23.323 Ancient Rome (3 q.h., Group I)

Roman civilization in ancient times, with emphasis on the rise of the Republic and the decline of the Empire.

23.328 The Middle Ages (3 q.h., Group I)

The history of Europe from the fall of Rome to 1350.

23.330 Byzantine History (3 q.h., Group I)

A political and cultural history of the Eastern Christian world from the fourth century to the sacking of Constantinople in 1453.

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23.331 Islamic History (3 q.h., Group IV)

The history of the Muslim Arab world from the seventh century to the end of the Abbasid Caliphate in 1258.

23.332 Ottoman History (3 q.h., Group IV)

A study of the rise, glory, decay, and attempts at reform in the Ottoman Empire from the thirteenth century to World War I.

23.333 History of the Jews I (3 q.h., Group I)

A survey of the Jews from the end of antiquity to early modern times from a cultural and intellectual perspective.

23.334 History of the Jews II (3 q.h., Group II)

The role and position of the Jews in modern history.

23.335 Modern Middle East (3 q.h., Group IV)

The Middle East since 1914 with attention to Zionism, Pan Arabism, the effects of two world wars, and the postwar settlements.

23.339 European Intellectual History since 1815 (3 q.h., Group II)

The main currents of European thought considered in their social and political context from Romanticism to the present.

23.340 Renaissance and Reformation (3 q.h., Group I)

The history of Europe from 1350 to 1648 with attention to intellectual and religious life and political and economic developments.

23.341 Europe, 1648-1789 (3 q.h., Group I)

Europe from the end of the Thirty Years' War to the French Revolution.

23.342 Europe, 1789-1870 (3 q.h., Group II)

Europe from the French Revolution to the Franco-Prussian War with a stress on the struggles for liberalism and nationalism.

23.346 Europe, 1870-1921 (3 q.h., Group II)

The background of World War I—nationalism, militarism, imperialism, the alliance system—and the making of war and peace.

23.347 Europe since 1921 (3 q.h., Group II)

Europe between the wars; World War II; the Cold War; efforts to unify the continent.

23.350 England to 1660 (3 q.h., Group I)

The Anglo-Saxons; the Norman Conquest; the rise of monarchy; religious developments.

23.351 England since 1660 (3 q.h., Group II)

England since the Restoration of the Stuarts with attention to the development of Parliament and democracy.

23.354 France since 1815 (3 q.h., Group II)

France after Napoleon with attention to continuing attempts by the French people to find satisfactory political institutions.

23.355 Germany after 1815 (3 q.h., Group II)

An analysis of the role of nationalism in German life after 1815 with emphasis on unification, militarism, and imperialism.

23.356 Italy since 1815 (3 q.h., Group II)

The unification of Italy, the attempt to establish constitutional monarchy, the rise of fascism after World War I, and the movement toward democratic republicanism after World War II.

23.357 Ireland since 1800 (3 q.h., Group II)

A study of the Irish question in British politics from the Act of Union to the present.

23.358 European Economy and Society to 1750 (3 q.h., Group I)

A topical survey of European economic and social development in the pre-industrial period.

23.359 European Economy and Society since 1750 (3 q.h., Group II)

A topical survey of European economic and social development from the beginnings of industrialization to the present.

23.360 American Indians (3 q.h., Group III)

A survey of native Americans from pre-Columbian times to the present.

23.361 Colonial America (3 q.h., Group III)

The exploration and settlement of North America; the development of political, social, and economic institutions; international rivalry to 1763.

23.363 The American Revolution (3 q.h., Group III)

British-American relations after 1763; war; and peace.

23.364 American Constitutional History I (3 q.h., Group III)

The making of the Constitution; constitutional issues from 1789 to 1900 with emphasis on federalism and government-economy matters.

23.365 American Constitutional History II (3 q.h., Group III)

The Constitution in the twentieth century with primary attention to the role of government in the economy and the protection of civil liberties and civil rights.

23.367 American Diplomatic History (3 q.h., Group III)

Selected topics in the history of American foreign relations and policy since 1789.

23.368 American Social History (3 q.h., Group III)

Selected topics in the life of the American people since 1789.

23.369 American Economic History (3 q.h., Group III)

Selected topics in the development of the capitalist economy in America with attention to the role of government since 1789.

23.371 American Urban History (3 q.h., Group III)

The development of urban society in the United States since 1800.

23.372 Boston to 1822 (3 q.h., Group III)

The town of Boston from its establishment in 1630; the development of political, economic, and social institutions.

23.373 Boston since 1822 (3 q.h., Group III)

The city of Boston; annexations; changes in the ethnic nature of the people.

23.374 African-American History (3 q.h., Group III)

The history of African-Americans from colonial times to the present.

23.376 The United States, 1920-1945 (3 q.h., Group III)

A topical history of the United States in time of world war, prosperity, depression, and war again.

23.378 The United States since 1945 (3 q.h., Group III)

The American people from the close of World War II to the present.

23.379 History of Sport in America (3 q.h., Group III)

A history of the major sports and their impact on American life.

23.384 The Far East to 1850 (3 q.h., Group IV)

The history of China and Japan prior to their opening by the West in the mid-nineteenth century.

23.385 China since 1850 (3 q.h., Group IV)

A century of China's history with emphasis on the western impact on Chinese civilization, China's struggle to maintain independence, and the victory of communism in the mid-twentieth century.

23.386 Japan since 1850 (3 q.h., Group IV)

An analysis of Japanese domestic developments and foreign relations since the mid-nineteenth century.

23.388 Africa to 1885 (3 q.h., Group IV)

African prehistory; the evolution of African government and society; the dynamics of Afro-European contact before 1885.

23.389 Africa since 1885 (3 q.h., Group IV)

The European impact on Africa; the rise of African nationalism; the emergence of independent African states; their relations with other nations.

23.392 India and Pakistan (3 q.h., Group IV)

The religious and political history of the peoples who formed India and Pakistan with an account of internal developments and foreign relations since independence.

23.393 Southeast Asia (3 q.h., Group IV)

The cultures of the peoples of Southeast Asia with an examination of the impact of European nations upon them and an account of their quests for national identity and economic development.

23.394 Russia to 1917 (3 q.h., Group II)

The emergence of Russia as a recognized European power; the history of the Russian people and government to the revolutions of 1917.

23.396 Russia since 1917 (3 q.h., Group II)

The revolutions of 1917 and the subsequent history of the Russian people and government with special emphasis on foreign relations.

23.397 Honors Program I (3 q.h.)

Prereq. Approval of Dean.

23.398 Honors Program II (3 q.h.)

Prereq. 23.397.

23.399 Honors Program III (3 q.h.)

Prereq. 23.398.

23.499 Field Work in History (6 q.h.)

Extra-collegiate experience in historical research or historical agencies. (Refer to page 76 for general description of field work courses). *Prereq.* Survey courses in World Civilization and American History and The Historian's Craft.

25—SOCIAL WELFARE (see page 172.)**26—PHILOSOPHY AND RELIGION**

Consultant: Prof. E. Hacker, Philosophy Dept. (L.A. College)

26.301 Introduction to Philosophy I (3 q.h.)

An examination of the aims, functions, and methods of philosophy. Questions in ethics and moral philosophy stressed in the last half of the course. *No prereq.*

26.302 Introduction to Philosophy II (3 q.h.)

Theories concerning the nature of ultimate reality, the nature of human knowledge, and the nature and existence of God. *No prereq.*

26.303 Introduction to Philosophy III (3 q.h.)

Social and/or political philosophy. Aesthetics and the philosophy of history may also be discussed. *No prereq.*

23.309 Major Thinkers of Our Time (3 q.h.)

A study of two or three philosophers, representative of which would be Austin, Ayer, Carnap, Dewey, Lewis, Maritain, Moore, Russell, or Whitehead. *Prereq.* 26.310 or equiv.

26.310 Introduction to Philosophy (Intensive) (9 q.h.)

Same as 26.301, 26.302, and 26.303.

26.314 The Human Search for Meaning (3 q.h.)

A philosophical study of the human struggle for meaning and identity. Some of the themes are: freedom and responsibility, alienation and anxiety, death and finitude. *No prereq.*

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26.315 Images of Man in Philosophy (3 q.h.)

A philosophical and literary study of the nature of man. *No prereq.*

26.317 Utopias and Anti-Utopias (3 q.h.)

A study of utopian and anti-utopian literature as expressions of social criticism and as theories of social reform. A class project may be the writing of a constitution for an ideal society. *No prereq.*

26.324 The Great Eastern Religions I (3 q.h.)

The development of Eastern primitive religions and their subsequent evolution into the sophisticated forms of the contemporary Eastern religions. *No prereq.*

26.325 The Great Eastern Religions II (3 q.h.)

Study of Egyptian and Babylonian religions, Confucianism, and Taoism. *Prereq.* 26.324.

26.326 The Great Eastern Religions III (3 q.h.)

Study of Hinduism, Buddhism, and Shintoism. *Prereq.* 26.325.

26.327 The Great Western Religions I (3 q.h.)

The development of Western primitive religions and their subsequent evolution into the sophisticated forms of the contemporary Western religion. *No prereq.*

26.328 The Great Western Religions II (3 q.h.)

Study of Zoroastrianism, Judaism, and Christianity. *Prereq.* 26.327.

26.329 The Great Western Religions III (3 q.h.)

Study of the religion of Islam, contemporary religious sects, and religious phenomena. *Prereq.* 26.328.

26.331 Ethics I (3 q.h.)

Analysis and criticism of moral argument. How to recognize areas of moral agreement and disagreement. Introduction to major moral viewpoints and their application to specific situations. *No prereq.*

26.332 Ethics II (3 q.h.)

Problems and issues encountered in important areas of moral concern, such as euthanasia, punishment, and moral responsibility. Various approaches to these problems may be explained, as related to basic moral viewpoints. *Prereq.* 26.331.

26.333 Ethics III (3 q.h.)

Issues and viewpoints concerning human nature and its relevance to morality, leading to examination of such topics as victimless wrongs and the relation between morality and the law. *Prereq.* 26.332.

26.334 Introduction to Logic (formerly Logic) (3 q.h.)

Basic logical concepts are explained: deductive and inductive arguments, valid and invalid arguments, kinds and uses of definitions, etc. The student is given the opportunity to recognize and evaluate different kinds of arguments. Emphasis is usually given to the study of methods of detecting and avoiding common errors in reasoning. *No prereq.*

26.335 Ethics (Intensive) (9 q.h.)

Same as 26.331, 26.332, and 26.333.

26.344 Selected Topics in Philosophy I (3 q.h.)

Advanced course. Readings chosen jointly by students and instructor. Has included such topics as aggression, utopian literature, Marxism, and pragmatism.

26.345 Selected Topics in Philosophy II (3 q.h.)

Continuation of 26.344.

26.346 Selected Topics in Philosophy III (3 q.h.)

Continuation of 26.345.

26.351 The Existentialist Revolt (3 q.h.)

Sources of existentialism in the Western tradition with emphasis upon Kierkegaard and Nietzsche. *No prereq.*

26.352 The Existentialist Challenge (3 q.h.)

The existential view of man and his world with emphasis upon Heidegger, Sartre, and the religious existentialists—Marcel, Tillich, and Buber. *Prereq.* 26.351.

26.353 Existentialism Appraised (3 q.h.)

Contemporary assessments of the existentialism movement, its meaning, significance, and truth. *Prereq.* 26.352.

26.360 Buddhism (3 q.h.)

The principle teachings of the Buddhists. *No prereq.*

26.361 Hinduism (3 q.h.)

The major Hindu teachings. *No prereq.*

26.362 Islam (3 q.h.)

The major principles of Islam. *No prereq.*

26.363 Judaism (3 q.h.)

The elements of Judaism. *No prereq.*

26.367 Mysticism: East and West (3 q.h.)

An exploration of mystical experiences through a discussion of some representative religious mystics. *No prereq.*

26.371 Inductive Logic and Scientific Method (3 q.h.)

The study of inductive logic. Emphasis is on evaluation of generalizations, problems in "weighing the evidence" and common errors in inductive reasoning. Also studied are Mill's methods of experimental inquiry and common errors in causal reasoning. *No prereq.*

26.372 Introduction to Symbolic Logic (3 q.h.)

An introduction to the fundamentals of propositional logic. Towards the end of the quarter the notation of the logic of quantifiers is introduced. *No prereq.*

26.374 Theistic, Atheistic, and Agnostic Philosophies (3 q.h.)

A comparative and evaluative study of selected theistic, atheistic, and agnostic philosophies. Some of the questions studied are: Is the belief in God necessary for a comprehensive philosophy of life? How does an atheistic philosophy explain and justify the "higher values" of man such as love, beauty, justice, etc? How is it possible to base a philosophy on the principle of agnosticism? *No prereq.*

26.375 Great Religious Thinkers (3 q.h.)

An in-depth study of three or four contrasting great religious thinkers. *No prereq.*

26.376 The Meaning of Death (3 q.h.)

Various philosophical and religious views concerning the meaning of death. Some of the questions discussed are: What attitude should one take regarding one's own finitude? What role does death play in our personal relations to others? Is a belief in an afterlife necessary in order to give meaning to this life? *No prereq.*

26.377 Philosophy of Consciousness (3 q.h.)

An exploration of the theories of consciousness and the possibility of higher states of consciousness. Readings may include some of the psychological and parapsychological literature on the subject. Also explored will be some of the techniques (meditation, etc.) that are alleged to lead to higher states of consciousness. *No prereq.*

26.378 Unorthodox Philosophies (3 q.h.)

A study of some current groups in Western culture whose philosophical and psychological teachings would be regarded as unorthodox by most experts in these areas. Some of these groups studied are: Scientology Society, International Meditation Society, Ouspensky-Gurdjieff Centers, etc. *No prereq.*

26.379 Philosophical Theories of Love (3 q.h.)

An examination and comparison of the four major philosophical-psychological theories of love in Western civilization: the Platonic, the Christian, the Romantic, and the Freudian theories. *No prereq.*

26.380 Philosophy in Literature (3 q.h.)

Analysis of basic philosophic themes expressed in such writers as: Tolstoy, Dostoevski, Thomas Mann, Sartre, Camus, Kafka, Hesse, and others. *No prereq.*

26.381 Philosophy of Art (Replaces 26.511, 26.512, 26.513) (3 q.h.)

An investigation into the nature of art and the experience of beauty. The aesthetic theories of Plato, Aristotle, Tolstoy, Kant, Dewey, and others are critically compared. Also studied are the problems of artistic taste, standards of criticism, and the objectivity of artistic judgements. *No prereq.*

26.382 Images of Woman in Philosophy (3 q.h.)

A philosophical approach to the study of woman in society. Drawing from the sources within the history of philosophy and literature this course will include such topics as: the role of women in society (ideal and actual), love and marriage, oppression and isolation, and the cult of virginity. *No prereq.*

26.383 Philosophy of Education (3 q.h.)

A study of contrasting theories of education. Questions examined are: What should be the goal of education? Can and should cultural values be taught? What are the values of a liberal arts education in a technical society? What is an ideal curriculum for the accomplishment of a given educational goal? *No prereq.*

26.384 Philosophy of Medicine (3 q.h.)

Social and moral problems created by medical science. Questions investigated are: Should a human life be prolonged under any condition and at any cost? What are the moral problems caused by the current medical definitions of death? Is it morally right to predetermine the physical characteristics of future generations by genetic engineering? etc. *No prereq.*

26.385 Social Philosophy (replaces 26.541, 26.542, 26.543) (3 q.h.)

Critical examination of the leading socio-political ideologies in regard to their conceptions of the character, structure, and function of society. *No prereq.*

26.386 Political Philosophy: Right vs. Left (3 q.h.)

An examination of the political philosophies underlying conservatism, liberalism, and radicalism. Emphasis will be on contemporary political trends. *No prereq.*

26.387 Dialectical Materialism: The Philosophy of Marxism (3 q.h.)

A study of the philosophical aspects of Marxism. Some attention will be given to Marx's view of society, history, economics, and ethics. *No prereq.*

26.388 Philosophy of History (3 q.h.)

Emphasis will be given to the speculative philosophy of history, that is, the attempt to discover some general pattern in the history of mankind. Some of the philosophers studied are: Hegel, Marx, Spengler, and Toynbee. *No prereq.*

26.389 Philosophy of Contemporary Social Criticism (3 q.h.)

A critical study of contemporary society and its institutions. Readings may include selections from the works of Paul Goodman, Lewis Mumford, and Eric Fromm. *No prereq.*

26.390 Philosophy of the Social Sciences (3 q.h.)

An examination and evaluation of the methodologies of the social sciences: sociology, psychology, history, political science, and economics. Some of the issues examined are: prediction and explanation in the social sciences, a comparison of the methodologies of the social and physical sciences, experimentation and verification in the social sciences. *No prereq.*

26.391 Philosophy of the Humanities (Intensive) (9 q.h.)

Same as 26.380, 26.381, 26.314.

26.392 The Great Eastern Religions (Intensive) (9 q.h.)

Same as 26.324, 26.325, 26.326.

26.393 The Great Western Religions (Intensive) (9 q.h.)

Same as 26.327, 26.328, 26.329.

26.394 Social-Political (Intensive) (9 q.h.)

Same as 26.385, 26.386, 26.389.

26.395 Logic (Intensive) (9 q.h.)

Same as 26.343, 26.371, 26.372.

26.396 Existentialism (Intensive) (9 q.h.)

Same as 26.351, 26.352, 26.353.

26.397 Philosophy of Religion (Intensive) (9 q.h.)

Same as 26.373, 26.374, 26.375.

26.398 Eastern Philosophies (Intensive) (9 q.h.)

Same as 26.360, 26.361, 26.362.

27—FINE ARTS

Consultant: Prof. R. L. Wells, Chairman, Art Dept. (L.A. College)

27.301 Introduction to the Arts (3 q.h.)

Introduction to the techniques and styles of various artistic expressions in painting, sculpture, drawing, architecture, and graphic arts.

27.304 History of Art I (3 q.h.)

History of Western art from prehistoric times to the end of the Roman Empire.

27.305 History of Art II (3 q.h.)

History of Western art from the end of the Roman Empire to the late sixteenth century.

27.306 History of Art III (3 q.h.)

History of Western art from the late sixteenth century to the twentieth century.

27.310 Ancient Painting and Sculpture I (3 q.h.)

A survey of art from the pre-historic period through Egypt and Mesopotamia.

27.311 Ancient Painting and Sculpture II (3 q.h.)

A survey of art from Crete through Greece and Rome.

27.312 Medieval Painting and Sculpture (3 q.h.)

Early Christian era: Byzantine, Romanesque, and Gothic Art.

27.314 European Painting (3 q.h.)

Development of painting from the late sixteenth century to the middle of the nineteenth century in Northern and Western Europe.

27.315 Modern Painting I (3 q.h.)

The development of painting from the late nineteenth century to the Surrealist movement.

27.316 Modern Painting II (3 q.h.)

The various styles of painting from Surrealism to contemporary art.

27.318 Twentieth-Century American Architecture (3 q.h.)

Study of architecture from Richardson to the present.

27.319 Twentieth-Century European Architecture (3 q.h.)

Study of architecture from Le Corbusier to the present.

27.320 Italian Renaissance Art (3 q.h.)

Study of painting and sculpture of the fifteenth and sixteenth centuries.

27.322 French Painting (3 q.h.)

Study of French painting of the nineteenth century.

27.324 American Art I (3 q.h.)

The development of American architecture, sculpture, and painting from Colonial times to the War of Independence.

27.325 American Art II (3 q.h.)

The development of American architecture, sculpture, and painting from the Revolution to the Civil War.

27.326 American Art III (3 q.h.)

The development of American architecture, sculpture, and painting from the Civil War to the present.

27.327 Life Drawing I (3 q.h.)

Basic life drawing involving anatomy and study of figure drawing. *Prereq.* 27.343 or other drawing courses on departmental approval.

27.328 Life Drawing II (3 q.h.)

Life drawing of the figure in various media. *Prereq.* 27.327.

27.329 Life Drawing III (3 q.h.)

Figure drawing and figure composition in various media. *Prereq.* 27.328.

27.330 Mixed Media I (3 q.h.)

This is a basic course in mixed media such as oil float, brayer printing, wash resist, glue resist, sponge printing, monotype, brownline prints, and sand casting. Emphasis will be on individual experimentation.

27.331 Mixed Media II (3 q.h.)

Creative expression in mixed media and experimentation.

27.332 Mixed Media III (3 q.h.)

Creative expression in advanced mixed media.

27.336 Latin American Art (3 q.h.)

Pre-Columbian and post-Columbian art forms of Latin America, including architecture, sculpture, painting, and the decorative arts—excluding Mexico.

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27.338 Chinese Painting (3 q.h.)

A history of the Chinese art of painting from its inception to the twentieth century.

27.339 Japanese Art (3 q.h.)

The arts of painting, sculpture, and architecture in Japan.

27.340 Freehand Drawing (3 q.h.)

An elementary course in drawing. (*Does not fulfill drawing requirement for the studio art major.*)

27.341 Drawing I (3 q.h.)

Practice in the techniques and development of drawing in pencil, pen and ink, with concentration on basic drawing problems.

27.342 Drawing II (3 q.h.)

Practice in the techniques of wash drawing, pastel and mixed color medias.

27.343 Drawing III (3 q.h.)

Study of human anatomy and introduction to figure drawing and composition.

27.344 Graphic Arts I—Woodcutting (3 q.h.)

Creative expression in graphic art media such as woodcuts and other relief printing.

27.345 Graphic Arts II—Silkscreen (3 q.h.)

Execution of prints in various media and the printing process of silkscreen.

27.346 Graphic Arts III—Etching (3 q.h.)

Execution of intaglio printmaking with various graphic media.

27.351 Painting—Basic Level I (3 q.h.)

Practice and creative expression in the technical fundamentals of figure and landscape painting.

27.352 Painting—Basic Level II (3 q.h.)

Creative expression in advanced painting problems of figure study. *Prereq.* 27.351 *or equiv.*

27.353 Painting—Basic Level III (3 q.h.)

Creative expression in advanced painting problems in composition. *Prereq.* 27.352 *or equiv.*

27.354 Painting—Advanced Level I (3 q.h.)

Painting with concentration upon the development of personal expression and style.

27.355 Painting—Advanced Level II (3 q.h.)

Painting with concentration upon the development of personal style and the execution of various painting problems.

27.356 Painting—Advanced Level III (3 q.h.)

Development of style and experimentation with various media.

27.357 Advanced Graphic Arts I (3 q.h.)

Execution of advanced printmaking in various media. *Prereq.* 27.344, 27.346, 27.347 or other graphics courses on departmental approval.

27.358 Advanced Graphic Arts II (3 q.h.)

Printmaking in various experimental media. *Prereq.* 27.357.

27.359 Advanced Graphic Arts III (3 q.h.)

Printmaking in various media. *Prereq.* 27.358

27.360 Oriental Indian Art (3 q.h.)

The national Indian styles of sculpture, painting, and architecture.

27.361 Basic Color and Design I (3 q.h.)

Study and practice of the principles of design and science of color.

27.362 Basic Color and Design II (3 q.h.)

Advanced study in the science of color.

27.363 Basic Color and Design III (3 q.h.)

Advanced problems in design.

27.364 Advanced Color and Design (3 q.h.)

Creative expression in various color and design problems.

27.371 Basic Commercial Design I (3 q.h.)

Study and creative work in layout, illustration, advertising, and typography.

27.372 Basic Commercial Design II (3 q.h.)

Commercial design techniques in various media.

27.373 Basic Commercial Design III (3 q.h.)

Commercial design techniques in various media.

27.374 Advanced Commercial Design (3 q.h.)

Creative problems in illustration design.

27.387 History of Photography I (3 q.h.)

Early developments in photography from ancient times to the daguerreotype.

27.388 History of Photography II (3 q.h.)

Developments of modern photography from the work of Stieglitz to the present.

27.389 History of Photography III (3 q.h.)

Study of styles in contemporary photography with emphasis on major modern photographs.

27.392 New York Art Seminar (3 q.h.)

Study and observation of the painting collections in the Metropolitan Museum of Art, Frick Collection, Museum of Modern Art, and the Guggenheim Museum.

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27.394 European Art Seminar (3 q.h.)

A four-week study and travel seminar through major European art centers, with emphasis on the major works of art in each.

27.400 Honors Program I (4 q.h.)

Prereq. Approval of the Dean.

27.401 Honors Program II (4 q.h.)

Prereq. 27.400.

27.402 Honors Program III (4 q.h.)

Prereq. 27.401.

27.403 Mexican Art (3 q.h.)

Pre-Columbian art from the Archaic and Classical periods to the present.

27.405 Watercolor Painting I (3 q.h.)

Practice and creative expression in the technical fundamentals of watercolor.

27.406 Watercolor Painting II (3 q.h.)

Creative expression in various techniques of watercolor. *Prereq.* 27.405.

27.407 Watercolor Painting III (3 q.h.)

Advanced expression in watercolor. *Prereq.* 27.406.

27.408 The Arts in Boston (3 q.h.)

An examination of the arts in Boston such as painting, sculpture, and architecture consisting of lectures, discussions, tours, and field trips.

27.409 Modern Sculpture I (formerly History of Sculpture) (3 q.h.)

Twentieth century sculpture with emphasis on principle movements and artists from Brancusi to Constructivism.

27.410 Native American Indian Art (3 q.h.)

The art of the first settlers, the native people of the western hemisphere except Mexico, from the Paleolithic period to the arrival of the Conquerors. Major works of painting, architecture, sculpture, and minor arts and crafts of the northern native people and Eskimos will be studied.

27.411 Art and Society I (3 q.h.)

A topical examination of the art of the past and present, focusing on its social and cultural significance.

27.412 Modern Sculpture II (formerly History of Modern Sculpture) (3 q.h.)

The study of sculpture from Constructivism to the present.

27.413 Art and Society II (3 q.h.)

A study of the connection that exists between art and society, focusing on a few key examples of painting, sculpture, and architecture of the age of the Renaissance and Baroque.

27.414 Art and Society III (3 q.h.)

A study of the connection that exists between art and society focusing on a few key examples of painting, sculpture, and architecture of the nineteenth and twentieth centuries.

27.415 Twentieth Century Figurative Sculpture (3 q.h.)

The study of the stylistic characteristics of the twentieth-century figurative sculpture with emphasis on major sculptors of Europe and America.

28—MUSIC

Consultant: Prof. R. L. Nadeau, Chairman, Music Dept. (L.A. College)

28.301 Introduction to Music (3 q.h.)

Introduction to selected works of our musical heritage from earliest times to contemporary styles. Primarily a survey and listening course, with emphasis on styles, basic theory, forms, and the historical, social, and artistic periods which these works represent.

28.303 Women in Music (3 q.h.)

A study in depth of the historical role of women in music; woman as composer, performer, patron, inspiration.

28.307 Fundamentals of Music I (for non-majors) (3 q.h.)

A course for beginners who are not music majors. The development of music reading and hearing skills. Simple notation of pitch and rhythm. Scales, intervals, chords.

28.308 Fundamentals of Music II (3 q.h.)

Continuation of course 28.307. New students admitted upon examination. Dictation, part-singing and sight-singing. Beginning instrumental studies in recorder. *Prereq.* 28.307 or *equiv.*

28.309 Fundamentals of Music III (3 q.h.)

Continuation of course 28.308. New students admitted upon examination. Major, minor, and modal melodies. Seventh-chord symbols. Voice leading, cadences. Choral analysis. Continuation of instrumental studies on recorder. *Prereq.* 28.308 or *equiv.*

28.310 Music and Art (3 q.h.)

A general chronological study of the close relationship between music and art, comparing the musical styles of many great composers and the pictorial qualities of the master painters.

28.311 History of Musical Styles (3 q.h.)

A course for non-music majors. A survey of the historical trends in music from ancient times to the present. Men, ideas, and events which have influenced change in musical style will be highlighted. From this course, the student should gain a broad overview of musical literature and history which will enhance understanding and future concert-going.

28.317 Music as a Means of Social Expression (3 q.h.)

Deals with the artist's involvement with the recurring social themes of man's view of himself, his search for brotherhood, his relation to minority groups and his sexual relationships. Paintings and literary works are used in addition to works by Beethoven, Schoenberg, Britten, and jazz composers.

28.321 The Symphony (3 q.h.)

A study of the symphony as the major genre in the classical romantic and contemporary periods. Works by Haydn, Mozart, Beethoven, Schumann, Tchaikovsky, Brahms, Sibelius.

28.322 The Concerto (3 q.h.)

The evolution of the concerto from its origins in the Baroque period to its use in our time. Concertos for every instrument are studied, including piano, cello, violin, horn, organ and bassoon.

28.324 The World of Opera (3 q.h.)

Analysis of opera as a dramatic form. Aria, recitative, ensemble, and other basic elements of opera are isolated and discussed. Numbers Opera, Music Drama, and Singspiel are some of the types of opera considered. Composers whose works are analyzed include Mozart, Wagner, Verdi, and Puccini.

28.326 Jazz: Evolution and Essence (3 q.h.)

Jazz from its origins in New Orleans to the avant-garde experiments of today. The rhythmic, harmonic, instrumental, and stylistic characteristics of jazz are analyzed. Attention is given to the works of creative jazz artists such as Armstrong, Beiderbecke, Parker, Ellington, and Coltrane.

28.328 Ear Training I (3 q.h.)

Rhythmic articulation. Solmization studies in major keys; G and F clef. Conductor's beat patterns in simple meter. Rhythmic and melodic dictation in major keys. Interval studies.

28.329 Ear Training II (3 q.h.)

Continuation of 28.328. Solmization studies in major keys with chromatics, and in minor keys: G, F, and C clef. Conductor's beat patterns in simple and compound meter. Melodic dictation in major and minor keys. Harmonic dictation. Interval studies. *Prereq.* 28.328 or *equiv.*

28.330 Ear Training III (3 q.h.)

Continuation of 28.329. Advanced rhythmic, melodic, and harmonic dictation. Sight singing of one- and two-part melodies in major and minor keys, with chromatics. Modulation. Singing in four parts. Advanced interval studies. *Prereq.* 28.329 or *equiv.*

28.331 Life and Works of J. S. Bach (3 q.h.)

The genius who summed up the Baroque era. A study of the man whose every note reflected his profoundly humanistic approach to religion. Works include large choral masterpieces such as the *St. Matthew Passion*, the *Brandenburg Concertos*, the *Well Tempered Clavier* and the Suites.

28.332 Life and Works of Mozart (3 q.h.)

A musical development from child prodigy to mature artist is traced from his own letters and from biographies. Many of his major works, including opera, symphonies, concertos, and chamber music are analyzed in detail.

28.333 Life and Works of Beethoven (3 q.h.)

An analysis of the complex personality and art of this major figure. His relation to the turbulent times in which he lived; his role in classical and romantic music.

28.334 Pedagogy of Music I (3 q.h.)

Introduction to philosophy principles and procedures in the teaching of music.

28.335 Pedagogy of Music II (3 q.h.)

Procedures, program planning, and techniques in teaching vocal and instrumental music. *Prereq.* 28.334 or consent of instructor prior to registration.

28.336 Pedagogy of Music III (3 q.h.)

Methods, procedures, and materials of/for advanced vocal and instrumental music instruction. *Prereq.* 28.334, 28.335 or consent of instructor prior to registration.

28.337 Conducting I (Basic Conducting) (3 q.h.)

The student is given the opportunity to learn how to develop a clear beat technique; how to prepare, teach, and polish a work in rehearsal; is exposed to a basic repertoire and the basics of vocal/instrumental production. *Prereq.* a fundamental knowledge of music reading and concurrent membership in a performing ensemble.

28.340 The Black Artist in Music (3 q.h.)

A study of the contributions of black composers and performers to the world of music.

28.341 Nationalism in Music (3 q.h.)

The relationship of folk song, dance, and art to symphonic literature; nationalistic elements in the music of Dvorak, Tchaikovsky, Grieg, Copland, Shostakovich, Sibelius; the effect of ideology on composers; the Soviet composers.

28.342 Music U.S.A. (3 q.h.)

American music from Puritan psalm singing to the present time. Folk music of ethnic origin, concert music, ragtime, jazz, and contemporary styles are discussed.

28.343 Great Choral Literature (3 q.h.)

A study of sacred and secular choral literature from medieval to contemporary times.

28.348 Great Love Songs Through the Ages (3 q.h.)

The music of love songs, ballads, chansons, lieder, and opera arias from the Middle Ages to today will be studied, listened to, and discussed.

28.349 A History of Musical Instruments in Western Culture (3 q.h.)

A study of the evolution of musical instruments from the Middle Ages to today. General principles of instrument construction and the historical contexts of their use through the ages will be discussed. The evolution of changing tastes in instrumental sound will be illustrated through listening to recordings and, whenever possible, through live performance. Planned field trips to the Boston Museum of Fine Arts

(which houses an excellent early instrument collection) and to various instrument builders in the Boston area will help give the student a firsthand view of some ancient and modern instruments.

28.351 Life and Works of Brahms (3 q.h.)

The Romantic-Classical; his technique of germinal motivic construction; a study of his symphonies, concertos, chamber music, the songs and the Requiem.

28.352 Life and Works of Chopin (3 q.h.)

A comprehensive study of the pianoforte compositions of Chopin including the sonatas, concertos, and the shorter forms such as the waltzes, nocturnes, preludes, mazurkas, etudes, scherzos, polonaises, impromptus, and ballades.

28.353 Melodrama and the Macabre: Aspects of Romanticism in Music (3 q.h.)

Program music of the Romantic period dealing with strange and macabre subjects. Works studied will include Schubert's "Erlkonig," Weber's *Der Freischutz*, and Berlioz' *Symphonie Fantastique*. Investigations will be made into the forces which produced this aspect of Romanticism with references to literature and art and how they affected the musical scene.

28.354 European Music and Art (3 q.h.)

A comparative study of how the European composers used the works of art of Spanish, English and German painters as inspiration for their individual musical scores. Analyzing many European museum paintings and their musical counterparts gives the student knowledge of the influence of the methods and works of art on the composition of these musicians.

28.355 Contemporary Opera (3 q.h.)

Almost every major composer, including Schoenberg, Berg, Bartok, Stravinsky, Hindemith, and Poulenc, has contributed to the opera repertory, thus illustrating twentieth-century style. Among the works studied are: *Wozzeck*, *The Rake's Progress*, *Dialogue of the Carmelites*, and *Bluebeard's Castle*.

28.358 Life and Works of Debussy (3 q.h.)

Claude Debussy, impressionist in sound, composed music that marked the turning point toward modern trends. Much of his music for piano, orchestra and opera will be studied, including *Pour le Piano Suite*, *Suite Bergamasque* (Clair de Lune), *Images* for piano and orchestra, *Nocturnes*, *La Mer* and the opera *Pelleas and Melisande*.

28.359 Life and Works of Verdi (3 q.h.)

The operas of Giuseppe Verdi, great composer of Italian opera, including such masterpieces as *Aida*, *Rigoletto*, *La Traviata*, *Il Trovatore*, *Othello*, and *Falstaff*.

28.360 Life and Operas of Giacomo Puccini (3 q.h.)

Tosca, *Madame Butterfly*, *La Boheme*, are a few of the operas of the Italian master to be studied in this course.

28.370 Music and Art of the Western World (3 q.h.)

Comparative study of the artists and composers of the New and Old Worlds.

28.371 Piano Class I (3 q.h.)

Fundamentals of music and interval identification. Realization of figured bass. Scales and arpeggios, hands separate. Ear training through keyboard harmony and some emphasis on ensemble playing. Repertoire requirements, early Mozart minuets, etc.

28.372 Piano Class II (3 q.h.)

Scales and arpeggios, hands together. Primary triads in some major and minor keys for improvisation and ear playing. Sight playing and some duet performances. Repertoire: *Anna Magdalena Notebook* by J.S. Bach. *Prereq.* 28.371 or equiv., or consent of instructor prior to registration.

28.373 Piano Class III (3 q.h.)

Scales and arpeggios, hands together (2 octaves). Primary triads in all keys adding secondary triads in some keys. Transposition of simple tunes, including the "National Anthem," using own accompaniment in all keys. Sight playing, Diller-Quaille Book II; Repertoire: *Complete Oxford Piano Course*. *Prereq.* 28.372 or equiv., or consent of instructor prior to registration.

28.374 Orchestral Instrument Class I (3 q.h.)

Basic problems involved in the performance of chamber music literature; intonation, rhythm, balance, and style.

28.375 Orchestral Instrument Class II (3 q.h.)

Advanced study of chamber music literature; emphasis on historical investigation and stylistic analysis.

28.376 Orchestral Instrument Class III (3 q.h.)

Performance and critical discussion of chamber music literature from all periods, culminating in an informal concert for invited guests and friends.

28.377 Voice Culture I (3 q.h.)

Blending with other voices. Elementary music reading. Singing of choral literature. Activity and performance with NU Chorus.

28.378 Voice Culture II (3 q.h.)

Intermediate reading skills. Conducting. Smaller choral ensemble literature. Activity and performance with NU Chorus. *Prereq.* 28.377 or equiv.

28.379 Voice Culture III (3 q.h.)

Survey of choral literature. Activity and performance with NU Chamber Group and Chorus. *Prereq.* 28.378 or equiv.

28.390 Directed Study (3 q.h.)

Independent work under the direction of the department upon a chosen topic. (*Limited to qualified students with approval of department chairman.*) *Prereq.* Dept. approval.

28.398 American Musical Theatre (3 q.h.)

A historical survey and analytic study of musical shows. Students will attend performances and write critical reviews.

28.399 Music Theory I—Fundamentals (3 q.h.)

Fundamentals. Pitch and rhythmic notation, scales, intervals, chord construction.

28.400 Music Theory II (3 q.h.)

Chord progression. Realization of figured bass, voice leading, harmonic rhythm. Non-harmonic tones. *Prereq.* 28.399 or *equiv. or consent of instructor prior to registration.*

28.401 Music Theory III (3 q.h.)

Harmonic analysis. Seventh chords, secondary dominants, modulation. *Prereq.* 28.400 or *equiv. or consent of instructor prior to registration.*

28.402 Music History I—Musical Literature to 1750 (3 q.h.)

A study of sacred and secular musical literature from the early Middle Ages through the Baroque. Listening to and discussion of monophony, organum, music of the troubadours and trouveres; motets, masses, and secular music by Machaut, Dufay, Josquin, Palestrina, Byrd; Elizabethan music, both vocal and instrumental; early Italian opera; music of the German Protestants culminating in the works of Bach and Handel will give the student an evolutionary view of music history and style during this period.

28.403 Music History II—Music of the Classical Period (3 q.h.)

A study of changing musical styles from Stamitz and the Mannheim School through the works of Haydn, Mozart, and early Beethoven.

28.404 Music History III—Music of the Romantic Era (3 q.h.)

Musical styles of the nineteenth century. The role of music and the musician in the changing social, economic, political, and cultural structure of Europe. Music by Beethoven, Schubert, Berlioz, Brahms, Verdi and Wagner will be heard, discussed, and analyzed.

28.405 Music Theory IV (3 q.h.)

Non-dominant seventh, ninth, eleventh, and thirteenth chords. Linear embellishment of harmony and harmonization of melody. *Prereq.* 28.401 or *equiv. or consent of instructor prior to registration.*

28.406 Music Theory V (3 q.h.)

Analysis of appropriate period forms and compositions. Chromatic and other non-diatonic harmony. Advanced modulation. *Prereq.* 28.405 or *equiv. or consent of the instructor prior to registration.*

28.407 Music Theory VI (3 q.h.)

Continuing analysis of compositions and period forms. Modern chord symbols. Basic principles of serial writing. Keyboard harmony. *Prereq.* 28.406 or *equiv. or consent of instructor prior to registration.*

28.408 Contrapuntal Techniques (3 q.h.)

A study of polyphonic techniques. *Prereq.* 28.399 or *equiv.*

28.410 Music History IV—Music of the 20th Century (3 q.h.)

The diversity of styles from Debussy through Stravinsky, Schoenberg, Bartok, Hindemith, and more recent developments including musique concrete, chance music, and electronic music.

28.411 Musical Performance I (1 q.h.)

Participation in rehearsals and public performances and/or research, composition, arranging, conducting, solo and ensemble activity, etc., with the NU Symphony Orchestra, the Early Music Players, the NU Chorus, the NU Bands, or other ensembles under the supervision and coaching of a faculty member of the Department of Music. The student's progress will be evaluated at the end of the quarter by audition or otherwise. *Prereq. Audition or permission of instructor.*

28.412 Musical Performance II (1 q.h.)

Prereq. Audition or permission of instructor.

28.413 Musical Performance III (1 q.h.)

Prereq. Audition or permission of instructor.

28.414 Musical Performance IV (1 q.h.)

Prereq. Audition or permission of instructor.

28.420 Music: A Listening Experience I (3 q.h.)

Designed to provide a discriminating aural appreciation of music. No previous musical knowledge is required. Each student studies at his or her own pace under supervision of the instructor. Listening for the simpler forms: strophic, sectional, multi-sectional, rondo, theme and variation forms.

28.421 Music: A Listening Experience II (3 q.h.)

(A continuation of 28.420) Listening for expanded structures: the sonata and concerto forms. *Prereq. 28.420 or equiv.*

28.422 Music: A Listening Experience III (3 q.h.)

(A continuation of 28.421) Listening for style and genre: music of various styles and historical periods. *Prereq. 28.421 or equiv.*

28.495 Honors Program I (4 q.h.)

Independent work in a selected musical area under the direction of members of the department. Limited to qualified students with the approval of the department chairman, and only by special arrangements with the supervising faculty member. *Prereq. Permission of the dean.*

28.496 Honors Program II (4 q.h.)

Prereq. 28.495.

28.497 Honors Program III (4 q.h.)

Prereq. 28.496.

29—SPEECH AND THEATRE ARTS

Consultant: Prof. E. J. Blackman, Chairman, Drama and Speech Dept. (L.A. College)

29.301 Effective Speaking I (3 q.h.)

Focus on development of personal communication skills; shaping messages; sending messages; listening; understanding non-verbal cues; trusting and coping with the various barriers to communication; feedback and interaction.

29.302 Effective Speaking II (3 q.h.)

The focus is on small-group communication; elements of group structure; task and maintenance functions by group members; leadership, formalized methods of group problem solving and decision making.

29.303 Effective Speaking III (3 q.h.)

The study and application of public communication skills both as disseminating information and as a catalyst for change; message preparation; information exchange; delivery; persuasive techniques are emphasized.

29.304 Voice and Articulation I (3 q.h.)

A practical course aimed at developing the speaking voice; special emphasis on articulation, pitch control, vocal variety, and flexibility; basic theory of the vocal mechanism.

29.305 Voice and Articulation II (3 q.h.)

Study of the science of speech sounds, investigation of regionalisms, individual voice development. *Prereq.* 29.304.

29.306 Oral Interpretation (3 q.h.)

Application of basic vocal techniques to the dramatic interpretation of various forms of literature.

29.307 Business and Professional Speaking (3 q.h.)

Practice in the organization and presentation of material to fit varying audiences. Emphasis on techniques of delivery and effective presentation of ideas.

29.308 Argumentation and Discussion (3 q.h.)

Designed to acquaint the student with the basic concepts of argumentation (evidence, research, refutation). Emphasis is placed on the psychology of an audience and various types of group discussion.

29.309 Parliamentary Procedure (3 q.h.)

Methods of conducting and organizing meetings. Development of effective leadership techniques. Experience in chairing a meeting and applying rules of order.

29.310 Theatre Management (3 q.h.)

A practical survey course in the business problems of financing, promoting, programming for educational, community, and professional theatre. Visits by practicing professionals; practical application through class projects working on actual productions. (A good course for those interested in business careers/arts management.)

29.311 Introduction to Theatre Arts (3 q.h.)

A course aimed at developing in theatregoers an appreciation of the total theatre experience, by studying the roles played by the artists and craftsmen of the theatre in bringing the playwright's script to life. The role of the director, actors, and designers. The role of the audience as critics.

29.321 Introduction to Dramatic Literature (3 q.h.)

The relationship between drama as literature and as theatre. Types of drama: comedy, tragedy, melodrama, farce, and drawing-room comedy. The dramatist's attitude and style: Classicism, Romanticism, Realism, Naturalism, and Theatricalism.

29.322 Masters of the Theatre I (3 q.h.)

The plays in relationship to their times, the theatres in which they were performed, and the dramatic theory of the age. An examination of selected plays from the Classical Greek and Roman, Medieval religious and secular, and Elizabethan theatre.

29.323 Masters of the Theatre II (3 q.h.)

The art of the Italian commedia dell'arte, the Neoclassic theatre of Racine, Moliere, and Dryden, the Restoration theatre, and the plays of Goldsmith and Sheridan.

29.324 Modern European Drama (3 q.h.)

An examination of European drama of the late nineteenth century and of the twentieth century reflecting the changing views toward the nature of man and the techniques of theatre.

29.325 Modern British Drama (3 q.h.)

The drama of England and Ireland of the twentieth century reflecting the impact of modern life upon modern theatre.

29.326 Modern American Drama (3 q.h.)

A view of American drama from 1900 to the present time. The American playwright reflecting the social, philosophical, and psychological temper.

29.327 Interpersonal Communications I (3 q.h.)

Ways of becoming more aware of self and one's relation to others. An exploration of various options for communicating and increasing one's knowledge of the group process. (enrollment limited)

29.328 Interpersonal Communications II (3 q.h.)

A continuation of 29.327. *Prereq.* 29.327. (enrollment limited)

29.329 Interpersonal Communications III (3 q.h.)

A continuation of 29.328. *Prereq.* 29.328. (enrollment limited)

29.341 Workshop for the Actor I (3 q.h.)

Physical preparation. Basic stage movement and deportment; the control of the stage voice; the analysis and establishment of characterization through observation and awareness of the body; improvisations and short scenes.

29.342 Workshop for the Actor II (3 q.h.)

Psychological preparation. The analysis and establishment of characterization through memory, emotion, imagination, and recall. Analysis of specific roles, the creation of a character analysis book, improvisations and short scenes.

29.343 Workshop for the Actor III (3 q.h.)

Preparing and performing the role. The physical and psychological preparation of specific roles. Short classroom scenes; the presentation of a one-act play.

29.350 The Comic Theatre (3 q.h.)

An examination of the writing and the staging of works by Aristophanes, Moliere, Shaw, Neil Simon. The nature, the functions, the techniques of comic writing and comic performance.

29.351 Of and By Women in the Theatre (3 q.h.)

The changing role of women as reflected in plays about and by women.

29.352 The Off-Broadway Theatre (3 q.h.)

The playwrights, the performers, and the audience of contemporary Off-Broadway theatre.

29.361 Announcing I (3 q.h.)

A course dealing with the delivery of all types of radio commercials.

29.362 Announcing II (3 q.h.)

A course dealing with the delivery of prepared as well as ad lib materials so that the announcer may strengthen his spontaneous broadcast speech abilities. *Prereq.*

29.361.

29.363 Announcing III (3 q.h.)

A course dealing with a variety of ad lib program types in both radio and television to aid the announcer in developing the ability to think quickly and speak fluidly and dynamically. *Prereq.* 29.362

29.364 Speaking Skills for International Students I (3 q.h.)

Beginning-level course designed for persons who have studied or are studying English presently. Instruction offered in pronunciation and intelligibility for formal and informal situations. Communication skills monitored through use of video and audio tape recordings and work in the language laboratory. Following diagnostic testing, students will participate in individualized, small and large group instructional situations. Placement tests will be given during the first week of class.

29.365 Speaking Skills for International Students II (3 q.h.)

Intermediate-level course designed for persons who have previously studied English, but who need to develop additional basic oral communication proficiency. Communication skills monitored through use of video tape and audio tape recordings and work in the language laboratory. Following diagnostic testing, students will participate in individualized, small and large group instructional situations. Placement tests will be given during the first week of class.

29.366 Speaking Skills for International Students III (3 q.h.)

Advanced-level course designed for students who have previously studied English and who can make themselves understood easily, but who have difficulty in purposeful oral communication. Task-oriented interaction, variety of two-person communication situations, and small group interactions. Progress monitored through use of video and audio tape recordings. Placement tests will be given during the first week of class.

29.396 New York Theatre Seminar (3 q.h.)

A seminar aimed at introducing the theatre arts to students by varied theatre-going experiences as well as formal class discussions, and studying the role of the New York stage in shaping contemporary American theatre.

29.398 Stratford Shakespeare Seminar (3 q.h.)

Seminar designed to give students an opportunity to attend four performances at the Stratford Festival Theatre; to meet with Festival actors, directors, designers; to tour the theatre plant; and to evaluate contemporary Shakespearian productions.

29.399 Creative Dramatics (3 q.h.)

Theories and methods of relating the creative techniques of pantomime, improvisations, and dramatization to work with children's programs in schools, churches, recreation facilities.

29.400 Children's Theatre (3 q.h.)

Analysis and creation of dramatic literature for children; the developing of a production for children.

30—ENGLISH

Consultant: Prof. M.X. Lesser, English Dept. (L.A. College)

Assoc. Consultant: Dean H. Vetstein

Each student enrolled in English I (30.305) will take a Placement Examination during class. Some students may be requested to register for Elements of Writing (30.304), a 3 q.h. course offering additional help in writing.

Courses required for Liberal Arts Majors are:

30.305, 30.306, 30.307 English I, II, III

For other majors, refer to English requirement listed under major.

During the changeover in English courses, the following will apply:

Students who have successively completed:

30.600 may register for 30.305, followed by 30.306 and 30.307.

30.601 may register for 30.306, followed by 30.307.

30.602 may register for 30.306, followed by 30.307.

30.604 may register for 30.307.

A. Writing and Language**30.301 English for International Students I** (non-credit)

An introduction to the grammar and rhetoric of English as a second language. Practice in listening, speaking, and writing, with selected readings and exercises for vocabulary and pronunciation.

30.302 English for International Students II (non-credit)

An intermediate course in English as a second language. Practice in preparing written and oral reports, including business and social letters. *Prereq.* 30.301 or equiv.

30.303 English for International Students III (non-credit)

An advanced course in English as a second language. Practice in special forms of writing to broaden diction, syntax, and organizational techniques. *Prereq. 30.302 or equiv.*

30.304 Elements of Writing (formerly 30.600) (3 q.h.)

An intensive review of grammatical forms and structural patterns of current English. Practice in writing sentences, paragraphs, and short papers.

30.305 English I (3 q.h.)

A detailed examination of the modes of rhetoric, especially exposition and argument. Practice in writing short papers based upon readings of expository prose.

30.306 English II (3 q.h.)

A detailed examination of the modes of rhetoric, especially description and narration. Practice in writing short papers and a fully-documented library paper based upon readings of fiction.

30.307 English III (3 q.h.)

The development of techniques for understanding imaginative literature. Practice in writing short papers and a fully-documented library paper based on readings of poetry and drama.

30.308 Expository Writing I (formerly 30.517, Intermediate Writing) (3 q.h.)

An intermediate course in expository prose, including the devices of classification and analogy, definition, and analysis. Practice in writing a variety of essays to discover and develop a personal style. *Prereq. 30.307 or equiv.*

30.309 Expository Writing II (3 q.h.)

An advanced course in expository prose, including critical and analytical reviews, articles, profiles, and sketches. Practice in writing these forms. *Prereq. 30.308 or equiv.*

30.310 Expository Writing III (3 q.h.)

A workshop in expository prose, emphasizing the practical problems of the writer on the job in advertising, public relations, or publishing. Practice in designing and writing special projects. *Prereq. 30.309 or equiv.*

30.311 Business Writing and Reports I (3 q.h.)

An introduction to the vocabulary and philosophy of business communications. Practice in the planning, writing, and analyzing of effective business letters and memoranda.

30.312 Business Writing and Reports II (3 q.h.)

Methods and principles of research and documentation of semi-technical analyses and business reports. Practice in organizing and writing complex forms of business communications. *Prereq. 30.311 or equiv.*

30.313 Business Writing and Reports (Intensive) (6 q.h.)

A combination of 30.311 and 30.312.

30.314 Technical Writing I (3 q.h.)

An introduction to the various types of technical documentation, memoranda, and reports. Practice in planning and writing such materials.

30.315 Technical Writing II (3 q.h.)

The preparation and development of proposals, technical manuals, and graphic aids for printed documents and presentations. Practice in writing proposals and manuals. *Prereq.* 30.314 or *equiv.*

30.316 Technical Writing III (3 q.h.)

Methods and principles of information retrieval, programmed instruction, and reproduction processes. Practice in writing and editing complex forms. *Prereq.* 30.315 or *equiv.*

30.317 Creative Writing: Fiction (formerly 30.518, Creative Writing I) (3 q.h.)

A course for beginning writers of short fiction. Practice in writing short stories in various forms; discussion and criticism of student work and selected texts.

30.318 Creative Writing: Poetry (formerly 30.519, Creative Writing II) (3 q.h.)

A course for beginning writers of poetry. Practice in writing poems in various forms and modes; discussion and criticism of student work and selected texts.

30.319 Creative Writing Workshop (formerly 30.590, Writers' Conference) (3 q.h.)

A course for the practiced writer of fiction or poetry. Discussion and criticism of student manuscripts. *Prereq.* 30.317 or 30.318 or *equiv.*

30.320 The English Language (formerly 30.525) (3 q.h.)

Development of modern English from pre-Anglo-Saxon beginnings; effects of Roman, Scandinavian, and Norman invasions; dialect geography; evolutionary change, word formation, and borrowing.

30.321 Linguistics (3 q.h.)

Theories of the nature and origin of language; review of historical and comparative linguistics; prescriptive and descriptive grammars; structural and generative-transformational phonology, morphology, and syntax.

30.322 Semantics (formerly 30.523) (3 q.h.)

The relation between language and behavior, levels of abstraction in communication, habits of evaluation of linguistic phenomena, and the modification of such habits for human understanding and survival.

B. Literature**30.324 Gothic Fiction** (3 q.h.)

A study of horror literature and its concerns with the supernatural, the irrational, the nature of evil, and the landscape of dreams, including such novels as *Dracula*, *Dr. Jekyll and Mr. Hyde*, and *The Turn of the Screw*.

30.328 The Psychological Novel (3 q.h.)

A study of the mental and emotional processes affecting the form and style of such novels as *Crime and Punishment*, *The Metamorphosis*, and *The Stranger*.

30.329 Children's Literature (3 q.h.)

A study of the psychology of creation, the ways of the imagination, and the role of fantasy and play in such children's books as *Alice in Wonderland*, *The Wizard of Oz*, and *Charlotte's Web*.

30.331 The Ancient World (formerly Western World Literature I) (3 q.h.)

The Bible and the principal writers of Greece and Rome, including such writers as Homer, Sophocles, and Virgil.

30.332 The Middle Ages (formerly Western World Literature II) (3 q.h.)

The major works of literature between 500 A.D. and 1500 A.D., including *The Song of Roland*, *The Divine Comedy*, *The Decameron*, and *The Canterbury Tales*.

30.333 The Renaissance (formerly Western World Literature III) (3 q.h.)

The literary achievements of renaissance Europe, including such writers as Machiavelli, Rabelais, Montaigne, and Cervantes.

30.334 Neoclassicism and Romanticism (formerly Western World Literature IV) (3 q.h.)

A study of major writers from the Age of Reason to the Victorian Age, including such writers as Racine, Voltaire, Goethe, and Wordsworth.

30.335 Realism and Naturalism (formerly Western World Literature V) (3 q.h.)

The fiction and drama of the second half of the 19th century, including such writers as Flaubert, Dostoevsky, Ibsen, and James.

30.336 The Modern World (formerly Western World Literature VI) (3 q.h.)

The principal literary influences in the twentieth century, including such writers as Eliot, Joyce, Mann, Kafka, Proust, and Camus.

30.338 Modern Irish Literature (3 q.h.)

Irish literature in English from 1885 to the present, including such writers as Yeats, Joyce, O'Casey, and Behan.

30.339 Irish Writers in America (formerly The Irish Influence in Selected Modern American Literature) (3 q.h.)

A study of Irish themes and attitudes in the fiction and drama of twentieth-century America, including such writers as O'Neill, Donleavy, Alfred, and McHale.

30.341 English Literature I (3 q.h.)

A survey of English literature from its beginnings to 1700, including works by Chaucer, Spenser, Shakespeare, Donne, and Milton.

30.342 English Literature II (3 q.h.)

A survey of English literature from the neoclassical to the romantic age, including works by Pope, Swift, Johnson, Blake, Wordsworth, and Keats.

30.343 English Literature III (3 q.h.)

A survey of English literature from the Victorian Age to the present, including works by Browning, Arnold, Hardy, Yeats, and Eliot.

30.344 American Literature I (3 q.h.)

A survey of American literature from the beginnings to the early 19th century, including works by Taylor, Edwards, Franklin, Cooper, and Poe.

30.345 American Literature II (3 q.h.)

A survey of the literature of the American Renaissance, including works by Emerson, Thoreau, Hawthorne, Melville, and Whitman.

30.346 American Literature III (3 q.h.)

A survey of American literature from the Civil War to the present, including the works of Dickinson, Twain, James, Fitzgerald, and Frost.

30.347 Science Fiction (3 q.h.)

The myths and rhetorical strategies of science fiction, including such novels as *Frankenstein*, *Childhood's End*, and *Stranger in a Strange Land*.

30.348 Images of Women in Literature (3 q.h.)

A descriptive and analytic study of the images of women and the archetypes underlying them in imaginative literature, including such writers as Homer, Austen, Ibsen, and Lawrence.

30.349 American Women Writers (formerly Images of Women in Lit. II) (3 q.h.)

A study of representative women writers in America in the 19th and 20th centuries, including such poets as Dickinson and Plath and such novelists as Chopin and Cather.

30.351 Chaucer I (3 q.h.)

An introduction to Middle English, its language and literature, with special attention to the historical, philosophical, and moral framework of *The Canterbury Tales*.

30.352 Chaucer II (3 q.h.)

A continuation of the detailed analysis of *The Canterbury Tales*.

30.353 Chaucer III (3 q.h.)

Troilus and Criseyde, *Book of the Duchess*, and other shorter works of Chaucer; a brief survey of medieval lyrics and drama.

30.354 Shakespeare I (3 q.h.)

The Elizabethan theater, Shakespeare's England, and such pre-1600 plays as *The Comedy of Errors*, *The Merchant of Venice*, and *I Henry IV*.

30.355 Shakespeare II (3 q.h.)

The comedies at the turn of the century and the early tragedies, such as *Twelfth Night*, *Much Ado About Nothing*, and *Hamlet*.

30.356 Shakespeare III (3 q.h.)

The later tragedies and the romance, such as *Othello*, *King Lear*, *Macbeth* and *The Tempest*.

30.357 The Seventeenth Century (3 q.h.)

The prose and poetry of the major writers from 1600 to 1660, including Bacon, Browne, Donne, Herbert, Webster, and Jonson.

30.358 The Eighteenth Century I (3 q.h.)

The major writers of the Restoration and the Augustan Age, including Dryden, Congreve, Addison, Steele, Pope, and Swift.

30.359 The Eighteenth Century II (3 q.h.)

The major writers of the later part of the century, including Johnson and Boswell, Goldsmith, Sheridan, Burns, and Blake.

30.361 Spenser (3 q.h.)

The work of the major nondramatic poet of the English Renaissance, including *The Shepheardes Calendar*, the sonnet cycle, and *The Faerie Queene*.

30.362 Milton I (3 q.h.)

A study of the early poetry and prose, including *Lycidas* and *Aeropagitica*; an introduction to the epic mode of *Paradise Lost*.

30.363 Milton II (3 q.h.)

A detailed analysis of *Paradise Lost*; its sequel, *Paradise Regained*; and the dramatic poem, *Samson Agonistes*.

30.371 The Nineteenth Century I (3 q.h.)

English Romanticism from 1798 to 1832, including the poetry of Wordsworth, Coleridge, Byron, Shelley, and Keats.

30.372 The Nineteenth Century II (3 q.h.)

The prose, poetry, and drama of the Victorian Age, including such writers as Carlyle, Ruskin, Tennyson, Browning, Wilde, and Shaw.

30.373 The Twentieth Century (3 q.h.)

The major writers of the modern period, including such writers as Yeats, Eliot, Joyce, Lawrence, Auden, and Thomas.

30.374 The Eighteenth Century English Novel (3 q.h.)

The development of the English novel and the characteristic quality of 18th-century fiction, including such writers as Defoe, Richardson, Fielding, Sterne, and Austin.

30.375 The Nineteenth-Century English Novel (3 q.h.)

The fiction of manners and morals in Victorian England, including such writers as Brontë, Dickens, Eliot, Thackeray, and Hardy.

30.376 The Twentieth-Century English Novel (3 q.h.)

The techniques and variety of modern English fiction, including such writers as Conrad, Foster, Joyce, Lawrence, Snow, and Murdoch.

30.378 Afro-American Literature I (3 q.h.)

A study of representative black authors from the Civil War to the Harlem Renaissance, including such writers as Chestnutt, Douglass, Toomer, and Hughes.

30.379 Afro-American Literature II (3 q.h.)

A study of representative black authors from the 1930s to the present, including such writers as Wright, Ellison, Baldwin, and Jones.

30.381 The American Short Story (3 q.h.)

The development of the American short story from its 19th-century origins to its present experiments, including such writers as Poe, Hawthorne, James, Hemingway, Roth, and Updike.

30.382 The Nineteenth-Century American Novel (3 q.h.)

The themes, forms, and techniques of the novel in 19th-century America, including such writers as Cooper, Melville, James, Twain, Howells, and Crane.

30.383 The Twentieth-Century American Novel (3 q.h.)

The themes, forms, and techniques of the novel in 20th-century America, including such writers as Dreiser, Lewis, Fitzgerald, Faulkner, Ellison, and Bellow.

30.384 Contemporary American Poetry (3 q.h.)

A study of the structure and themes of poetry in post-1945 America, including such writers as Ginsberg, Plath, Snodgrass, and Wilbur.

30.385 The Contemporary Novel (formerly The Modern European Novel) (3 q.h.)

A study of the structure and themes of post-1945 American, British, and European novels by such writers as Barth, Hawkes, Lessing, Powell, Grass and Solzhenitsyn.

30.387 Contemporary English Poetry (3 q.h.)

A study of the structure and themes of poetry in post-1945 England, including the work of Gunn, Hughes, Larkin, and Levertov.

30.391 Honors Program I (4 q.h.) See p. 75.**30.392 Honors Program II (4 q.h.)**

Prereq. 30.391.

30.393 Honors Program III (4 q.h.)

Prereq. 30.392.

31-34—MODERN LANGUAGES

Consultant: Prof. L. Cooperstein, Chairman, Modern Language Dept. (L.A. College)

31—FRENCH

31.401 Elementary French I (4 q.h.)

Essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary and idiomatic expressions.

31.402 Elementary French II (4 q.h.)

Continuation of grammar study. Oral and written exercises. *Prereq.* 31.401 or *equiv.*

31.403 Elementary French III (4 q.h.)

Reading of French prose of increasing difficulty, with written and oral exercises based on the materials read; practice in conversation. *Prereq.* 31.402 or *equiv.*

31.404 Intermediate French I (4 q.h.)

A review of grammar, with practice in composition and conversation. *Prereq. 31.403 or equiv.*

31.405 Intermediate French II (4 q.h.)

History of French civilization, with discussions and conversation. *Prereq. 31.404 or equiv.*

31.406 Intermediate French III (4 q.h.)

Intensive reading of modern French prose, with conversational practice. *Prereq. 31.405 or equiv.*

31.407 Elementary French (Intensive) (12 q.h.)

Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple French prose. Develops into the reading of more difficult work accompanied by practice in conversation. *(Not open to students who have taken 31.401, 31.402, 31.403.)*

31.408 Intermediate French (Intensive) (12 q.h.)

Same as 31.404, 31.405, and 31.406. *(Not open to students who have taken 31.404, 31.405 and 31.406.)*

31.421 French Literature I (3 q.h.)

Origins of French literature with readings from major works of the Middle Ages. *Prereq. 31.406 or equiv.*

31.422 French Literature II (3 q.h.)

Selections from the Classical period in the seventeenth and eighteenth centuries. *Prereq. 31.421 or equiv.*

31.423 French Literature III (3 q.h.)

Readings from major works of the nineteenth and twentieth centuries. *Prereq. 31.422 or equiv.*

32—SPANISH

32.401 Elementary Spanish I (4 q.h.)

Essentials of grammar, practice in pronunciation, progressive acquisition of a basic vocabulary and idiomatic expressions.

32.402 Elementary Spanish II (4 q.h.)

Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty. *Prereq. 32.401 or equiv.*

32.403 Elementary Spanish III (4 q.h.)

Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty. *Prereq. 32.402 or equiv.*

32.404 Intermediate Spanish I (4 q.h.)

Review of grammar, with practice in composition and conversation. *Prereq. 32.403, 32.411 or equiv.*

32.405 Intermediate Spanish II (4 q.h.)

Spanish civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings. *Prereq.* 32.404 or *equiv.*

32.406 Intermediate Spanish III (4 q.h.)

Spanish-American civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings. *Prereq.* 32.405 or *equiv.*

32.407 Elementary Spanish (Intensive) (12 q.h.)

Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Spanish prose. Develops into the reading of more difficult work accompanied by practice in conversation. (*Not open to students who have taken 32.401, 32.402, 32.403.*)

32.408 Intermediate Spanish (Intensive) (12 q.h.)

Same as 32.404, 32.405 and 32.406. (*Not open to students who have had 32.404, 32.405, and 32.406.*)

32.409 Conversational Spanish I* (4 q.h.)

This course is intended to provide students with a basic speaking ability and understanding of everyday Spanish. (*No previous background needed.*)

32.410 Conversational Spanish II* (4 q.h.)

Continued building of basic skills in conversational Spanish. *Prereq.* 32.409 or *equiv.*

32.411 Conversational Spanish III* (4 q.h.)

A continuation of 32.410. *Prereq.* 32.410 or *equiv.*

33—GERMAN

33.401 Elementary German I (4 q.h.)

Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

33.402 Elementary German II (4 q.h.)

More difficult points of grammar—particularly uses of subjunctive mood. *Prereq.* 33.401 or *equiv.*

33.403 Elementary German III (4 q.h.)

Reading of simple German prose, with oral and written exercises based on material read; German conversation encouraged. *Prereq.* 33.402 or *equiv.*

33.404 Intermediate German I (4 q.h.)

A review of grammar, with practice in composition and conversation. *Prereq.* 33.403 or *equiv.*

*Will satisfy the elementary language requirement only.

33.405 Intermediate German II (4 q.h.)

History of German civilization, with discussions and conversation. *Prereq. 33.404 or equiv.*

33.406 Intermediate German III (4 q.h.)

Intensive reading of modern German prose, with conversational practice. *Prereq. 33.405 or equiv.*

34—ITALIAN

34.431 Elementary Italian I (4 q.h.)

Essentials of grammar; practice in pronunciation; and progressive acquisition of a basic vocabulary and idiomatic expressions.

34.432 Elementary Italian II (4 q.h.)

Continuation of grammar study. Oral and written exercises. *Prereq. 34.431 or equiv.*

34.433 Elementary Italian III (4 q.h.)

Reading of Italian prose of increasing difficulty; with written and oral exercises based on the material read; practice in conversation. *Prereq. 34.432 or equiv.*

34.434 Intermediate Italian I (4 q.h.)

A review of grammar, with practice in composition and conversation. *Prereq. 34.433 or equiv.*

34.435 Intermediate Italian II (4 q.h.)

History of Italian civilization with discussions and conversation. *Prereq. 34.434 or equiv.*

34.436 Intermediate Italian III (4 q.h.)

Intensive reading of modern Italian prose, with conversational practice. *Prereq. 34.435 or equiv.*

38—JOURNALISM

Consultant: Prof. G. A. Speers, Chairman, Journalism Dept. (L.A. College)

38.304 Newswriting I (3 q.h.)

Obtaining and organizing facts; the writing of basic news stories. Subjects covered may include the five "W's" and the "H" of news, inverted pyramid form, news values, and leads.

38.305 Newswriting II (3 q.h.)

Analysis of different types of news stories through assignments and class discussions; building news stories; news interview stories, and other types. *Prereq. 38.304 or equiv.*

38.306 Newswriting III (3 q.h.)

Investigative reporting, feature stories, editorials. Copyediting exercises and assignments in specialized writing. Libel, slander, and other legal matters affecting journalism. *Prereq. 38.305 or equiv.*

38.307 Techniques of Journalism I (3 q.h.)

Techniques of journalism, stressing actual assignments and classroom discussion of students' work. Course applies basic newswriting practices to assignments. *Prereq.* 38.306 or *equiv.*

38.308 Techniques of Journalism II (3 q.h.)

Focus on handling stories that emanate from various "beats," including courts and government beats; and investigative reporting. *Prereq.* 38.307 or *equiv.*

38.309 Techniques of Journalism III (3 q.h.)

Concentration on fields of "specialities" of business, sports, editorials, and student development of a special project in journalism. *Prereq.* 38.308 or *equiv.*

39—ECONOMICS

Consultant: Prof. M. A. Horowitz, Chairman, Economics Dept. (L.A. College)

Associate Consultant: Prof. H. Goldstein (L.A. College)

39.301 Economic Principles and Problems I (3 q.h.)

Development of macroeconomic analysis; review of national income concepts; national income determination, fluctuation, and growth; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade; balance of international payments.

39.302 Economic Principles and Problems II (3 q.h.)

The role of a market pricing system, demand and supply, in determining the allocation of resources to competing uses and why this system may not function adequately in certain areas. Application of economic principles to private and public problems in such areas as pollution, poverty, and racial discrimination. *Prereq.* 39.301 or *equiv.*

39.303 Economic Principles and Problems III (3 q.h.)

Applications of economic principles to selected problem areas: poverty, competition, labor, agriculture, urban. *Prereq.* 39.302 or *equiv.*

39.304 Economics (Intensive) (9 q.h.)

Combination of Economic Principles and Problems I, II, and III. (Not open to students who have taken 39.301, 39.302, 39.303).

39.311 Statistics I (3 q.h.)

Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. *Prereq.* 39.303 or *equiv.*

39.312 Statistics II (3 q.h.)

Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution, and chi square. *Prereq.* 39.311 or *equiv.*

39.313 Statistics III (3 q.h.)

Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment, and index numbers. *Prereq.* 39.312 or *equiv.*

39.314 Statistics (Intensive) (9 q.h.)

Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution, and chi square. Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment, and index numbers. *Not open to students who have taken 39.311, 39.312, 39.313. Prereq. 39.303 or equiv.*

39.317 Money and Banking I (3 q.h.)

Introduction to money and credit, commercial banking structure, and money creation; problems and policy of central banking in the United States. *Prereq. 39.303 or equiv.*

39.318 Money and Banking II (3 q.h.)

Theory of money and prices and monetary policy; interest theory, debt management, and international monetary problems and analysis. *Prereq. 39.317 or equiv.*

39.319 Government Finance (formerly Public Finance) (3 q.h.)

Fiscal functions, institutions, and politics; growth of the public sector; expenditure planning in theory and practice; cost-benefit analysis; principles of taxation and tax incidence; major taxes at Federal and state-local levels; fiscal policy for high employment, price stability, and growth; current fiscal problems such as tax reform, urban fiscal problems, fiscal federalism, and income maintenance programs. *Prereq. 39.318 or equiv.*

39.321 Economic Growth and Development I (3 q.h.)

Analysis of the development of the western market system. Introduction to economic growth and alternative approaches to economic development. *Prereq. 39.303 or equiv.*

39.322 Economic Growth and Development II (3 q.h.)

An introductory analysis of economic factors and institutions as well as an examination of the effect of psychological, social, and political influences upon economic development. *Prereq. 39.321 or equiv.*

39.323 Government and Business I (3 q.h.)

Role of government in national economic affairs— theory and practice. *Prereq. 39.303 or equiv.*

39.324 Government and Business II (3 q.h.)

The relationship between government and business and anti-trust laws. *Prereq. 39.323 or equiv.*

39.325 American Economic History (3 q.h.)

Economic development of the United States with emphasis upon the post-Civil War period and selected European developments. *Prereq. 39.303 or equiv.*

39.326 Government and Business III (3 q.h.)

Application of anti-trust laws to business—emphasis on cases, principles, and current anti-trust problems. *Prereq. 39.324 or equiv.*

39.327 Labor Economics (3 q.h.)

Development of labor organizations, their aims and methods. Issues in collective bargaining and public policy toward labor. *Prereq. 39.303 or equiv.*

39.331 Business Cycles I (3 q.h.)

Intermediate macro-economic theory. Theory of cyclical fluctuations in the context of multiplier and accelerator models. *Prereq. 39.303 or equiv.*

39.332 Business Cycles II (3 q.h.)

Business cycle analysis, measurement, and public policy. *Prereq. 39.331 or equiv.*

39.333 Business Cycles III (3 q.h.)

Business cycle forecasting methods and services. *Prereq. 39.332 or equiv.*

39.339 Managerial Economics (3 q.h.)

An application of the theory of demand, price, and output to the business firm and capital budgeting. *Prereq. 39.303 or equiv.*

39.341 Medical Economics (3 q.h.)

Examination and discussion of the following topics: health care trends in the United States; causes for increases in medical care costs; supply and training of health care personnel; the nation's need for physicians, nurses, pharmacists and other allied health personnel; the quality of medical care; economics of health insurance plans; consumer demand for health care, medical facilities, professional personnel, and semi-professional personnel.

39.342 Economics of Crime (3 q.h.)

Theoretical and empirical analysis of the economic causes of criminal behavior will be presented. The social costs of crime and its prevention will be covered, and techniques for designing optimum law enforcement policies will be developed.

39.343 Poverty and Discrimination (3 q.h.)

Analysis of trend and composition of poverty in America. Examination of labor market, demographic and institutional forces contributing to poverty; role of education; economics of race and sex discrimination; public welfare system and proposed reforms.

39.352 Economics of World Energy and Primary Resources (3 q.h.)

Investigates economic, political, and historical backgrounds of the energy and other resource problems. Future impact of primary resources limitations on U.S. and world economics will be analyzed. Feasibility studies of resource substitution.

39.353 Superpower Economics (3 q.h.)

Analyzes the relative economic structure and strength of the U.S., U.S.S.R., Japan, and the Common Market and China, as well as the economic relations among these powers. Also may examine the impact of these relations on the domestic economies of the superpowers and of the developing nations of the world.

39.354 Economics of Urban Transportation (3 q.h.)

Transportation and land-use patterns; externalities; social costs and social benefits of various modes of urban transportation; ownership, regulations, and financing of

various modes of transportation; economies of new technology in urban transportation.

39.355 Economics of the Quality of Urban Environment and Control (3 q.h.)

Economic analysis of air, water, thermal, and noise pollution; the utilization of urban space and other urban resources, identification of possible economic effects of urban environment, such as crime, delinquency, immobility, and congestion.

39.357 Manpower and Anti-Poverty Policies and Programs (3 q.h.)

Assessment of government and private efforts to fight poverty and improve the labor market position of impoverished groups; relationship between causes of poverty and discrimination; and possible remedies. Manpower training programs, negative income tax, family allowances, and other income maintenance schemes.

39.361 Urban Economics (3 q.h.)

An inquiry into the causes of the location and the growth of urban centers; economic analysis of selected urban problems, such as housing, transportation, land use, and public services. Exploration of public policies related to such problems.

39.391 Honors Program I (4 q.h.)

Prereq. Approval of Dean.

39.392 Honors Program II (4 q.h.)

Prereq. 39.391.

39.393 Honors Program III (4 q.h.)

Prereq. 39.392.

40—LIBRARY SCIENCE

Consultant: Mr. Frank Seegraber, Boston College

40.301 Introduction to Library Science (3 q.h.)

Brief survey of the history of books and librarianship. The development of libraries in the United States with some emphasis on recent federal and state library legislation. The library profession, its philosophy, publications, and organizations.

40.302 Selection of Library Materials (3 q.h.)

Principles and practices in the selection of materials for the modern library; bibliographic aids to selection; practice in preparation of book notes and book reviews.

40.311 Organization of the Library (3 q.h.)

The organization, administration, and services of municipal libraries; public library systems in the United States; the role of public libraries as educational institutions.

40.312 Multi-Media Centers (3 q.h.)

Organization and management of elementary and secondary school libraries; problems in the selection and evaluation of multi-media materials necessary to the school curriculum.

40.313 Administration of Multi-Media Centers (3 q.h.)

The library as a media center for instructional materials; problems in personnel and budgeting; the library's role in the school curriculum and its services to students and faculty.

40.314 Multi-Media Materials and Services (3 q.h.)

The selection, organization, and use of multi-media materials in school libraries; types of library equipment and services; cataloging of school library materials.

40.321 Introduction to Reference Materials and Methods (3 q.h.)

The basic tools and methods for locating information. Evaluation of dictionaries, encyclopedias, gazetteers and atlases, handbooks, almanacs, directories, and indexes.

40.322 Reference Work in the Social Sciences (3 q.h.)

Scope and use of outstanding reference materials, including government publications, in the broad range of the social sciences: economics, education, political science, sociology, and allied fields. *Prereq. 40.321 or equiv.*

40.323 Reference Work in the Humanities (3 q.h.)

Approaches to the solution of reference problems in the humanities, with special emphasis on literature. *Prereq. 40.321 or equiv.*

40.326 Library Community Relations (3 q.h.)

An exploration of creative approaches and practical techniques for reaching individuals and groups with dynamic library science. Emphasis on modern public relations methods and media.

40.331 Descriptive Cataloging (3 q.h.)

Theory and practice of descriptive cataloging, introducing techniques of compiling author, corporate, and serial entries.

40.332 Subject Headings and Classification (3 q.h.)

Introduction to Dewey Decimal Classification and Sears subject headings; further study of descriptive cataloging in book and non-book materials. *Prereq. 40.331 or equiv.*

40.333 Library of Congress Classification (3 q.h.)

The significant differences between LC and Dewey. Notes on original cataloging and techniques of classification within the LC scheme. Exercises in the use of LC schedules and subject headings. *Prereq. 40.331 or equiv.*

40.341 Introduction to Children's Literature (3 q.h.)

The history of children's literature; current trends in its publication and social forces that influence its production; criteria for evaluation and aids for selection of types of children's books.

40.342 Library Service to Young People (3 q.h.)

Study of adolescent needs in the field of literature with application to both public and school libraries; special attention to the problem of material selection, book talks, and discussion groups.

LIBERAL ARTS INTENSIVE COURSES

16.304 Earth Sciences (Intensive) (9 q.h.)

A composite of 16.301, 16.302, and 16.303, as a one-quarter course.

19.307 Psychology (Intensive) (9 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurements and testing, and principles of animal and human learning. Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. Personality theory and measurements, behavior disorders, mental health, and psychotherapy. (Not open to students who have taken 19.301, 19.302, 19.303.)

19.344 Abnormal Psychology (Intensive) (9 q.h.)

Same as 19.341, 19.342, 19.343. *Prereq.* 19.303 or *equiv.*

20.304 Anthropology (Intensive) (9 q.h.)

Same as 20.301, 20.302, and 20.303.

21.304 Sociology (Intensive) (9 q.h.)

Basic concepts and theories relating to the study of humans as participants in group life. Examines social structure, culture, socialization, the family, primary groups, associations, social stratification, collective behavior, population, and problems of social, political, urban, and industrial change. Term papers or essays may be required. (Not open to students who have taken 21.301, 21.302, 21.303.)

21.417 Social Theory I (Intensive) (4 q.h.)

A historical survey of sociological theorists, including the work of de Tocqueville, Comte, Marx, Durkheim, Cooley, Weber, Simmel and others. *Prereq.* *Consent of the instructor or 12 q.h. in sociology-anthropology.* (Not open to students who have credit for 21.317, 21.318, or 21.319.)

21.418 Social Theory II (Intensive) (4 q.h.)

A study of the major theoretical issues in sociology. Discussion concentrates on systematic questions and topics, but material is drawn from theorists such as Mannheim, Merton, Parsons. Students may be required to present papers in class on questions of theoretical interest: e.g. the problem of order, the problem of change, the role of the individual in change, etc. *Prereq.* 21.417 or *equiv.* (Not open to students who have credit for 21.317, 21.318, or 21.319.)

22.304 Principles of Political Science (Intensive) (9 q.h.)

Evolution of the nation-state. Analysis of basic political concepts. Study of basic forms of the contemporary political system. Analysis of constitutional and totalitarian models. Study of contemporary British and Soviet political systems. The American political system including study of Civil Rights. International politics and American foreign policy since 1945. (Not open to students who have taken 22.301, 22.302, 22.303, or *equiv.*)

22.329 Comparative Politics (Intensive) (4 q.h.)

A comparative analysis of political culture, organization and behavior in different national settings.

26.310 Introduction to Philosophy (Intensive) (9 q.h.)

Same as 26.301, 26.302, and 26.303.

26.335 Ethics (Intensive) (9 q.h.)

Same as 26.331, 26.332, and 26.333.

26.391 Philosophy of the Humanities (Intensive) (9 q.h.)

Same as 26.380, 26.381, and 26.314.

26.392 The Great Eastern Religions (Intensive) (9 q.h.)

Same as 26.324, 26.325, 26.326.

26.393 The Great Western Religions (Intensive) (9 q.h.)

Same as 26.327, 26.328, 26.329.

26.394 Social-Political (Intensive) 9 q.h.)

Same as 26.385, 26.386, 26.389.

26.395 Logic (Intensive) (9 q.h.)

Same as 26.343, 26.371, 26.372.

26.396 Existentialism (Intensive) (9 q.h.)

Same as 26.351, 26.352, 26.353.

26.397 Philosophy of Religion (Intensive) (9 q.h.)

Same as 26.373, 26.374, 26.375.

26.398 Eastern Philosophies (Intensive) (9 q.h.)

Same as 26.360, 26.361, 26.362.

30.313 Business Writing and Reports (Intensive) (6 q.h.)

A combination of 30.311 and 30.312.

31.407 Elementary French (Intensive) (12 q.h.)

Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple French prose. Develops into the reading of more difficult work accompanied by practice in conversation. (*Not open to students who have taken 31.401, 31.402, 31.403.*)

31.408 Intermediate French (Intensive) (12 q.h.)

Same as 31.404, 31.405, and 31.406. (*Not open to students who have taken 31.404, 31.405 and 31.406.*)

32.407 Elementary Spanish (Intensive) (12 q.h.)

Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Spanish prose. Develops into the reading of more difficult work accompanied by practice in conversation. (*Not open to students who have taken 32.401, 32.402, 32.403.*)

32.408 Intermediate Spanish (Intensive) (12 q.h.)

Same as 32.404, 32.405, and 32.406. (*Not open to students who have had 32.404, 32.405, and 32.406.*)

39.304 Economics (Intensive) (9 q.h.)

Combination of Economic Principles and Problems I, II, and III. (*Not open to students who have taken 39.301, 39.302, 39.303.*)

39.314 Statistics (Intensive) (9 q.h.)

Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution, and chi square. Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment, and index numbers. Not open to students who have taken 39.311, 39.312, 39.313. *Prereq. 39.303 or equiv.*

BUSINESS ADMINISTRATION

41—ACCOUNTING

Consultant: Prof. J. W. Golemme (College of Business Admin.) 437-3244

Coordinator (Upper Level Courses): Prof. Paul A. Janell (College of Business Admin.) 437-3240

Coordinator (Accounting Principles): Dean Walter E. Kearney, Jr. (Northeastern University) 437-2312

41.301 Accounting Principles I (3 q.h.)

The basic concepts and methodology of accounting for service and merchandising businesses, and accounting for business assets.

41.302 Accounting Principles II (3 q.h.)

Emphasizes financial reporting, income measurement, valuation and appraising the financial results of business operations. *Prereq. 41.301.*

41.304 Accounting Principles (Intensive) (6 q.h.)

Same as Accounting Principles I and II.

41.307 Accounting for Management Decisions I (3 q.h.)

(For non-accounting majors.) The preparation and interpretation of financial statements, including cash and funds flow, for internal use by the company. *Prereq. 41.302.*

41.308 Accounting for Management Decisions II (3 q.h.)

(For non-accounting majors.) The preparation and interpretation of cost accounting information and the utilization of this information in the managerial decision-making process. *Prereq. 41.307.*

41.309 Accounting for Management Decisions (Intensive) (6 q.h.)

Same as Accounting for Management Decisions I and II. *Prereq. 41.302.*

41.401. Intermediate Accounting I (3 q.h.)

A comprehensive examination of the accounting process and the financial statements generated by that process. The focus is on current assets. Specific topics

include cash, receivables, investments in marketable securities and inventories. *Prereq. 41.302.*

41.402 Intermediate Accounting II (3 q.h.)

A continuation of Intermediate Accounting I. A detailed examination of current liabilities, fixed assets including depreciation, intangible assets, and stockholder equity accounts. *Prereq. 41.401.*

41.403 Intermediate Accounting III (3 q.h.)

A comprehensive examination of some specialized problem areas relating to the preparation and interpretation of financial statements. Topics may include earnings per share, pensions and leases, income tax allocation, accounting changes, bonds payable, and long-term investments. *Prereq. 41.402.*

41.404 Intermediate Accounting (Intensive) (6 q.h.)

Same as Intermediate Accounting I and II. *Prereq. 41.302.*

41.405 Cost Accounting I (3 q.h.)

The foundations of cost accounting, including terminology, purpose, and relationship with financial accounting; familiarization with product costing systems and their usefulness. *Prereq. 41.302.*

41.406 Cost Accounting II (3 q.h.)

Budgetary planning and control with the emphasis on the use of cost data for current operations, special decisions, and long-range planning. *Prereq. 41.405.*

41.407 Advanced Accounting I (3 q.h.)

An in-depth analysis of specialized problem areas in accounting. Topics may include price-level accounting, accounting for partnerships, accounting for branches, segmental reports, interim statements, and forecasts. *Prereq. 41.403.*

41.408 Advanced Accounting II (3 q.h.)

A comprehensive examination of the problems associated with business combinations. A study of the purchase and pooling methods of consolidations, including an examination of financial reporting by multinational corporations. *Prereq. 41.407.*

41.409 Advanced Accounting III (3 q.h.)

A study of the accounting problems associated with bankruptcy and corporate reorganization, estates and trusts, and some special problems related to installment sales and consignments. A detailed examination of accounting for "Not-for-Profit Entities." *Prereq. 41.408.*

41.410 Seminar in Contemporary Accounting Problems I (3 q.h.)

The careful examination of the underlying concepts and conventions of accounting and their application to financial statements. An in-depth analysis of the areas of revenue and income recognition. *Prereq. 41.403 and 41.406.*

41.411 Seminar in Contemporary Accounting Problems II (3 q.h.)

The examination of cost determination and allocation and depreciation. An in-depth study of specialized areas including such topics as pensions, leases, stock options, and business combinations. *Prereq. 41.410.*

220 / COURSE DESCRIPTIONS

41.412 Auditing I (3 q.h.)

The examination of auditing requirements relative to the professional ethics and legal responsibility of the certified public accountant. A study of the use of the computer in auditing and the utilization of statistical sampling techniques. *Prereq. 41.403.*

41.413 Auditing II (3 q.h.)

The methods and approach utilized in auditing aspects, liabilities, owners equity, and nominal accounts of the firm. *Prereq. 41.412.*

41.414 Auditing (Intensive) (6 q.h.)

Same as Auditing I and II. *Prereq. 41.403.*

41.415 Federal Income Taxes I (3 q.h.)

The application of the Federal Tax Law to the individual's income, gains, losses, and expenses. A study of the individual's special deductions. *Prereq. 41.403.*

41.416 Federal Income Taxes II (3 q.h.)

A study of some specialized tax problems related to the individual. Topics include installment sales and income averaging. A study of the application of the Federal Tax Law to the corporation. *Prereq. 41.415.*

41.417 Internal Auditing I (3 q.h.)

Designed to aid in understanding how a modern internal audit function undertakes to review and appraise diverse operations. Studies the audit organization, selection and development of staff, preparation of long-range programs, performing preliminary surveys, and developing audit programs. Techniques of internal audit appraisal are examined. Topics may include regression analysis and statistical sampling. Case studies may be employed. *Prereq. None.*

41.418 Internal Auditing II (3 q.h.)

Continuation of the study of techniques of internal audit appraisal. Topics may include computers as an audit tool, auditor responsibilities, audit work papers, reports, reviews, replies, and management summaries. Case studies are employed. *Prereq. 41.417.*

41.419 Tax Factors in Business Decisions (3 q.h.)

An overview of federal income tax provisions that impact on business and investment decisions. Emphasizes the rationale of tax provisions and stresses the tax planning responses. (Not open to accounting majors.). *Prereq. 41.302.*

41.420 Essentials of Personal Income Taxation (3 q.h.)

A special course designed for those students who are not majoring in accounting. The course is designed to teach important aspects of personal income taxation on both the federal and state level. Tax law, tax planning, and the preparation of individual tax returns are emphasized.

43—MARKETING

Associate Consultant: G. P. Foster, 749-1599, *Coordinator:* George S. Hennessy (696-8531)

43.301 Introduction to Marketing I (3 q.h.)

An overview and introduction to marketing and marketing management in the company and in society based upon text readings and case analyses of the environment within which business decisions take effect, marketing activities and decisions, and their impact and reaction to consumer attitudes and behavior. (A required course for marketing and other indicated concentrations.)

43.302 Introduction to Marketing II (3 q.h.)

A continuation of Marketing I with emphasis on distribution channels, pricing, product planning, packaging, branding, physical distribution, and marketing communications leading to use of cases and development of strategies involving all marketing functions. *Prereq.* 43.301.

43.303 Introduction to Marketing (Intensive) (6 q.h.)

An overview and introduction to marketing and marketing management in the company and in society based upon text readings. The emphasis on distribution channels, pricing, product planning, packaging, branding, physical distribution, and marketing communications enables the student to use case work in developing the strategies necessary to cope with all marketing functions and the problems faced both within the industry and in reaction to consumer attitudes and behavior.

43.310 Advertising and Sales Promotion Management I (3 q.h.)

The principles of advertising and sales promotion and their place as communications and motivational functions in the marketing mix. *Prereq.* 43.302.

43.311 Advertising and Sales Promotion Management II (3 q.h.)

A continuation of Advertising and Sales Promotion Management I with use of case histories and contemporary projects to illustrate the development of creative concepts and the use of various media in support and achievement of overall sales and marketing goals. *Prereq.* 43.310.

43.313 Marketing Research I (3 q.h.)

The use of marketing research as a tool in planning, controlling, and evaluating marketing activities, including an introduction to the application of behavioral and quantitative concepts in the making of marketing decisions and the management of marketing programs. (Required of marketing concentrates. Open to others as an elective course.) *Prereq.* 43.302.

43.314 Marketing Research II (3 q.h.)

Modern techniques of data collection and analysis in marketing research, forecasting, product planning, sales control, test marketing, marketing evaluation, and marketing information systems. (Open as an elective to marketing and other concentrates.) *Prereq.* 43.313.

43.315 Marketing and Sales Seminar (3 q.h.)

The capstone marketing course required of seniors concentrating in marketing. The focus is upon the formulation, implementation, and review of marketing, sales, and advertising strategy at a policy level in the current dynamic and socially conscious environment. (Not open to non-marketing concentrates.) *Prereq.* 43.314.

43.316 Public Relations I (3 q.h.)

An introduction and overview of the basic principles, purposes, and methods of public relations in both profit and non-profit or non-commercial organizations.

43.317 Public Relations II (3 q.h.)

A continuation of Public Relations I, providing in-depth coverage of the planning, management, operation, and evaluation of public relations programs through text readings and case and contemporary project analyses. *Prereq.* 43.316.

43.318 Introduction to Advertising (3 q.h.)

Particularly for the non-marketing (including non-business) concentrate. A broad survey and evaluation of advertising as a major form of communication, motivation, and influence in business, society, and contemporary culture. *Prereq.* 43.302.

43.319 Retail Management I (3 q.h.)

The use and role of retailing in marketing management and strategy. Included are activities and contributions of the various retailing institutions: independents and chains, dealerships, specialty stores, fashion stores, department stores, supermarkets, discount stores, others. Topics include retail management, retail profit and loss, starting a retail business, store location, store planning, and the retail organization. *Prereq.* 43.302

43.320 Retail Management II (3 q.h.)

A continuation of Retail Management I, with stress upon retailing operations including stores operations, merchandising planning and control merchandise management, pricing, buying, store and sales promotion, customers' services, retail accounting, and expense management. *Prereq.* 43.319.

43.321 Consumer Education (3 q.h.)

A review of the growing impact of consumerism and environmentalism upon resource use and business practice, with stress upon the need for consumer competency in managing money, purchasing goods and services, the use of credit, consumer legislation, evaluation of consumer research and product testing, and the role of the consumer in the economy.

43.322 Sales Management I (3 q.h.)

Through readings and case studies, the creation, organization, operation, management of the sales force, with stress upon the structure of the sales organization, the role and selection of the sales personnel, are analyzed. (Required of marketing concentrates. Open to others as an elective.) *Prereq.* 43.302.

43.323 Sales Management II (3 q.h.)

A continuation of Sales Management I with stress upon management, supervision and evaluation of the sales force and of personal selling in marketing strategy and programs. (Required of marketing concentrates. Open to others as an elective course.) *Prereq.* 43.322.

43.324 Consumer Behavior (3 q.h.)

An analysis of economic, behavioral, and other models of consumer behavior as bases for the planning and evaluation of marketing effort. (Required of marketing concentrates. Open to others as an elective course.) *Prereq.* 43.313.

43.325 Industrial and Institutional Marketing (3 q.h.)

The marketing of goods and services where business firms and non-profit or non-commercial organizations are the customers. Reading and business case studies illustrate the application of marketing, sales, and advertising management techniques to very significant areas of social need and progress. *Prereq. 43.302.*

43.326 International Marketing (3 q.h.)

The opportunities, methods, and policies in management of international marketing, sales, and advertising programs. Stress is upon sales in markets outside of the United States. Included are exports, foreign sales and marketing branches, the multinational corporation. *Prereq. 43.302.*

43.327 Product Management and Development (3 q.h.)

An analysis of the problems which firms face in directing, managing, and planning their product development activities. Presented are current trends and concepts in new and existing product planning, development, improvement, and marketing. Both consumer and industrial products and services are studied. *Prereq. 43.302*

43.328 Salesmanship I (3 q.h.)

Primarily for the student interested but not experienced in personal selling. A review of opportunities in personal selling for both men and women and its contributions in society and marketing is followed by an introduction to sales and selling principles broadly applicable in many types of selling. *Prereq. 43.302.*

43.329 Salesmanship II (3 q.h.)

Primarily intended for the student with experience or background in sales or selling. Techniques are developed as required for the selling of goods and services through middlemen and direct to the consumer. Both industrial, non-commercial, and consumer channels are studied. *Prereq. 43.328*

43.330 Advertising and Sales Promotion (Intensive) (6 q.h.)

Principles of advertising and sales promotion and their function as communications and motivational forces in the marketing mix. Includes text material, cases, field assignments, and relevant projects. Covers the creative process, the use of written, audio, and visual media, the elements of the promotional mix and the selection of advertising and sales promotion strategies to support sales and marketing goals. *Prereq. 43.302 or 43.303.*

43.331 Sales Management (Intensive) (6 q.h.)

Comprehensive study of the principles and strategies of effective sales management. Combines readings, case studies, field assignments, and projects. Covers organization, selection operation, supervision, evaluation, and management of the sales force, and the role of sales operations in the planning and execution of marketing strategy. *Prereq. 43.302 or 43.303.*

43.332 Retail Management (Intensive) (6 q.h.)

Concentrated, in-depth study and analysis of the retailing structure, its operations, its management and its future. Includes text material, case studies, field assignments, and projects. Covers all types of retailing: independents, chains, supermarkets, mass merchandising, department stores, speciality stores. Topics included are merchandising, pricing, buying, promotion, location, store planning, profitability, and operations. *Prereq. 43.302 or 43.303.*

43.333 Salesmanship (Intensive) (6 q.h.)

Principles and techniques of selling. Stresses the role of the individual and how he or she can motivate others. Combines text materials, field assignments, case studies, and projects. Covers personal selling as required for both products and services (tangible and intangible), and as required for sales through all channels of distribution as well as direct. Industrial and consumer products and services included. *Prereq.* 43.302 or 43.303.

43.334 Marketing Management I (3 q.h.)

An upper-level study of management viewpoints, strategies, and programs to support corporate goals through the marketing process, including budgeting and the P & L responsibility. *Prereq.* 43.302.

43.335 Marketing Management II (3 q.h.)

In-depth analysis of marketing programs using case techniques and development of marketing strategies and programs utilizing all facets of the marketing mix. *Prereq.* 43.334.

43.336 Marketing Management (Intensive) (6 q.h.)

Same as 43.334, 43.335. Not open to students who have taken those courses.

43.337 Marketing and the Government (3 q.h.)

An in-depth study and analysis of the increasingly important legal aspects of marketing. Includes laws and philosophies of government and society as they relate to pricing, discounts, distribution, product warranty and performance, advertising claims, competitive actions, environmental impact, and consumer protection. Combines text material and case studies. *Prereq.* 43.302 or 43.303.

44—FINANCE AND INSURANCE

Finance

Consultant: Prof. R. J. Hehre (College of Business Administration) (432-3248)

Coordinator: W. F. Hancock, Jr. (653-2576)

44.301 Introduction to Financial Management (3 q.h.)

A survey of the scope and nature of financial management including forms of ownership and their effect on the division of risk, income, and control within the organization; the impact of taxes on financial decisions; financial statements and financial analysis; planning, budgeting, and controlling cash flows including sources and uses of funds. Introduction to investments and investment management. (No prerequisite although 39.303 and 41.302 are highly recommended.)

44.310 Financial Management I (3 q.h.)

Working capital policy and the management of current assets, major sources of short-term financing, interest factors in financial decisions, capital budgeting techniques, investment decisions under uncertainty, sources and forms of long-term financing. *Prereq.* 44.301.

44.311 Financial Management II (3 q.h.)

Financial structure, leverage, valuation, rates of return, and the cost of capital; dividend policy and internal financing; timing of financial policy. External growth and

mergers. Failure, reorganization, and liquidation. International finance. *Prereq.* 44.310.

44.312 Investments I (3 q.h.)

Investment goals and objectives. Various types of investments. Role of security markets. Security analysis. *Prereq.* 44.301.

44.313. Investments II (3 q.h.)

Relationship between the economy and stock prices. Corporate analysis, earnings, dividends, and cash flow. Introduction to portfolio analysis. Technical analysis vs. fundamental factors. *Prereq.* 44.312.

44.314 Credit Management I (3 q.h.)

An introduction to credit and its functions. Role of the credit executive, credit investigation, documentary credit, trade credit. Organization of the credit department. *Prereq.* 44.301.

44.315 Credit Management II (3 q.h.)

Various forms of credit and collection services. Analysis of financial statements, determination of credit worthiness. Creditor's rights, adjustment bureau operations, credit insurance and guarantees. *Prereq.* 44.314.

44.316 Profit Planning and Control I (3 q.h.)

An intensive treatment of managerial planning, budgetary control, and financial analysis. Interrelationship between functional areas in an organization using consolidated profit planning as an integrating device. Fundamental financial analysis, comprehensive profit planning, general expense planning, production planning, materials planning, purchasing. *Prereq.* 44.301.

44.317 Profit Planning and Control II (3 q.h.)

Development and application of variable budgets, planning and controlling capital expenditures, computer applications in profit planning, cash flow planning and control, cost-profit-volume analysis, performance reporting and analysis of budget variations. *Prereq.* 44.316.

44.318 Management of Financial Institutions I (3 q.h.)

A detailed examination of the role, diversity, and operation of the various financial institutions in our economy, including banking and related units; operating objectives, techniques and services. *Prereq.* 44.301.

44.319 Management of Financial Institutions II (3 q.h.)

Investment objectives and asset management. Liquidity, adequacy of capital, portfolio management and selection. Control and community relations. *Prereq.* 44.318.

44.320 Advanced Financial Management (3 q.h.)

A wider and more intensive investigation into the problems of financial management with emphasis on decision making. Specific topics include inflation, competition for investment funds, financial control and problems of the divisionalized company, and the interrelated problems of creating and maintaining a capital structure. *Prereq.* 44.311.

44.321 Personal Finance (3 q.h.)

(Recommended for non-Finance majors.) A practical approach to problems of managing personal finances. Topics include financial planning, budgeting, obtaining credit and loans, income taxes, savings and investments, life insurance, home buying, and estate planning. Subjects are treated on a non-technical basis.

44.322. Advanced Investment Management (3 q.h.)

Theories and practice of portfolio selection and management. Special cases and their resolution. Fund management. Legal liability. *Prereq. 44.313.*

44.323 Seminar in Finance (3 q.h.)

An intensive analysis of current problems in finance. Student research and presentation of individual papers. *Prereq. 44.311.*

44.324 Seminar in Investments (3 q.h.)

An intensive analysis of current problems in investments. Student research and presentation of individual papers. *Prereq. 44.313.*

44.325 Personal Financial Management I (3 q.h.)

Development of the professional personal financial manager. Analysis of needs and objectives, personalities, limits and constraints. Techniques for need fulfillment and cash management. *Prereq. 44.301.*

44.326 Personal Financial Management II (3 q.h.)

Individual aspects of personal financial plans. Impact of taxes and tax planning. Insurance, trust arrangements, estate planning. *Prereq. 44.325.*

44.327 Personal Financial Management (Intensive) (6 q.h.)

A one-quarter course covering the same material found in Personal Financial Management I and II. *Prereq. 44.301.*

44.328 International Finance I (3 q.h.)

Introduction to international financial management in the multi-national corporation. Analysis of basic problems and finance considerations involved with international investments, trade, and payments. Planning in the international environment related to exchange rates, currency revaluations, inflation, and local government policies. *Prereq. 44.311.*

44.329 International Finance II (3 q.h.)

Analysis of the financial strategy involved with international investment alternatives, sources of capital, working capital management, fund flows, and management control through accounting and financial reporting. *Prereq. 44.328.*

44.330 New Venture Financing (3 q.h.)

Designed to assist the entrepreneur in establishing and financing his or her own business. Particular problems of small business finance as well as the expansion of established and growing businesses are given close attention. Methods of raising and safeguarding capital and the practical management of new business financial problems are covered as well. Field work and guest lecturers are featured wherever practical. *Prereq. 44.311.*

44.331 Financial Management (Intensive) (6 q.h.)

A one-quarter course covering the same material found in Financial Management I and II. *Prereq.* 44.301

44.332 Investments (Intensive) (6 q.h.)

A one-quarter course covering the same material found in Investments I and II. *Prereq.* 44.311.

44.333 Consumer Finance (3 q. h.)

An extension of personal finance into the specific area of consumer finance for both business and non-business students. The course will give the opportunity to the student to examine consumer installment sales laws, consumer protection statutes, financing practices of banks and other financing institutions. Activities of the consumer affairs offices of the Attorney General's and Banking Commissioner's departments and their influence on consumer finance will be analyzed. Attention will be focused on a practical interpretation of laws and practices dealing with contracts.

Insurance

Coordinator (Insurance): R. L. Peretti (536-8110)

44.401 Insurance (3 q.h.)

This course is intended to acquaint each student with personal property and liability risks, and the forms of insurance designed to meet these risks. The emphasis is placed on basic insurance principles inherent in life, homeowners, and automobile coverage. *Prereq.* 44.301.

44.402 Property and Casualty Insurance I (3 q.h.)

The basis of modern property-casualty insurance. Analysis of the insurance contract, its application, meaning, and rating. *Prereq.* 44.401.

44.403 Property and Casualty Insurance II (3 q.h.)

Study of various policies including automobile, homeowners, inland marine, and commercial special multiperil. *Prereq.* 44.402.

44.404 Life Insurance I (3 q.h.)

A study of the origin, development, and basis of modern life insurance. Analysis and comparison of the various policies and riders and their uses. *Prereq.* 44.401.

44.405 Life Insurance II (3 q.h.)

The fundamentals of programming, including beneficiary designations, settlement options, and tax implications. Company organization and operations: underwriting, investments, and regulations. *Prereq.* 44.404.

44.406 Health and Social Insurance I (3 q.h.)

A study of the economic basis served by health and social programs of insurance, including a detailed analysis and comparison of the plans offered. *Prereq.* 44.404.

44.407 Health and Social Insurance II (3 q.h.)

A continuing study of contracts, including benefit structure, rate-making, reserves, and the proper use and coordination of the plans available from private industry and from the government. *Prereq.* 44.406.

44.408 Estate Planning (3 q.h.)

The use of insurance and other techniques in planning disposition, administration, and taxation of testamentary and inter vivos transfer of property. *Prereq. 44.401.*

44.409 Group Insurance and Pensions (3 q.h.)

The nature, development, and coverage offered by group life and health insurance. Analyses of the various kinds of individual and group pension plans and their use. *Prereq. 44.404.*

44.410 Business Insurance (3 q.h.)

Insurance aspects peculiar to business units. A study of plans and programs designed to provide protection for multiperil, diversified industrial, and commercial organizations. Impact of government regulation. *Prereq. 44.401.*

45—MANAGEMENT

Consultant: Prof. D. McCarthy (College of Business Administration) (437-3256)

Associate Consultant: Mr. W. A. Gagne (647-2121)

Coordinator: Mr. R. L. Goldberg (469-0938)

General Management**45.301 Management and Organization I (3 q.h.)**

To introduce the new business person to the setting and general structure of American business which includes objectives and practices as they affect the American standard of living; the characteristics of private enterprise, and the nature and challenge of capitalism and other forms of economic enterprise. The student is introduced to the forms of business, both large and small; to the structures of organizations; the functions of management as they tend to influence the various forms of business. This course provides the opportunity for understanding what a career on the management level of organizations involves; what problems must be faced; what decisions must be reached.

45.302 Management and Organization II (3 q.h.)

To introduce the business person to methodologies in planning, organizing, directing, and controlling the functions of production, marketing, sales, and pricing as they relate to the American free enterprise systems as contrasted to other systems of international business. Examination of modern, effective, and proven tools and techniques for coping with the myriad interrelationships and intricacies of systems management. Develops a more comprehensive understanding of the total structure of business and other enterprises. *Prereq. 45.301.*

45.303 Principles and Practices of Management (3 q.h.)

Takes the student from definitions and fundamentals of business to basic concepts relating to the functions of management and to the analytical techniques which are necessary to successful decision-making. Emphasizes that management is a continuous process of action by involving the student in "how to" design an organization, understand and deal with people, evaluate the political, social, and economic environment, effectively plan, direct, and control the organization. Short cases and professional articles, included in the text, provide provocation material for discussion and reinforcement of management concepts. *Prereq. 45.301.*

45.304 Management and Organization (Intensive) (6 q.h.)

This course combines Management and Organization I and Principles and Practices of Management into a single course offered twice a week for a single quarter. Please refer to the course descriptions for details.

45.306 Project Planning and Control (3 q.h.)

Employs a systems approach to planning, scheduling, and controlling of large and small projects. The course is a combination of lectures and case studies that introduce and utilize various tools and techniques including bar charts, networks, critical path analysis, and an introduction to PERT. The course will assist the student in planning, scheduling, and allocating resources as a basis for controlling projects and comparing actual against planned performance. It is hoped that students will gain experience through their active participation in the case studies. *Prereq.* 45.301.

45.310 Management Decisions and Policies I (3 q.h.)

Examines the total management process associated with the formulation and implementation of an effective strategy for the entire enterprise. Part I deals with the development of corporate objectives, plans, and policies with emphasis on the interaction between the enterprise and its environment and the consideration of public responsibility. *Prereq.* 100 quarter hours.

45.311 Management Decisions and Policies II (3 q.h.)

The organizations and administrative functions for converting strategic plans into corporate performance and achievements are considered. The concepts of strategic planning and implementation are explored from the perspective of the general manager; particular attention is given to examination and identification of the functions, responsibilities, styles, values, and organization relationships of enterprise top management. Cases are drawn from profit and non-profit oriented enterprises of various sizes in diversified fields, operating within many different business environments. Students should plan to actively participate in class discussion of case studies. *Prereq.* 45.310.

45.312 Management Decisions and Policies (Intensive) (6 q.h.)

Please refer to the course description for Management Decisions and Policies, I and II. The contents of the intensive course are the same except it is presented twice per week during a single quarter. *Prereq.* 100 quarter hours.

45.313 Management Seminar I (3 q.h.)

A broad interdisciplinary project utilizing one or more of the techniques of library research, field research, field surveys, and organizational audits. Students will have the opportunity to utilize the knowledge gained in earlier course work. *Prereq.* 45.311.

45.314 Management Seminar II (3 q.h.)

A continuation of Management Seminar I. *Prereq.* 45.313.

45.315 Effecting Change (3 q.h.)

Applies managerial concepts and practices within policy or resource constraints to real time operational situations. Recognizing that today's business manager must operate in an environment of accelerating change, the course considers current fac-

tual examples of changing situations and examines guidelines for their resolution. In addition, it explores the process by which the manager makes decisions dealing with the impact of change on the organization and its personnel. Utilizing actual problems confronting today's organizations, the student progressively investigates change stemming from actions of managers and other individual contributors at all levels of the organization. This investigation attempts to determine the sources of change and viable alternative courses of action. The course develops a conceptual framework for handling change in one's own business career. *Prereq.* 45.303.

45.318 Motivation, Management, and Leadership (3 q.h.)

This course applies some of the important concepts from behavioral science and analyzes theories of motivation and leadership for use by the manager. Through readings and discussion of cases and student-introduced motivation and leadership situations, the student is provided an opportunity to view and understand the working environment as a combination of processes which influence performance and the outcome of individual and group endeavor. *Prereq.* 45.303.

45.323 Entrepreneurship and Small Business Management I (3 q.h.)

This course is designed as an introduction to the major aspects of managing a small business. Areas probed cover basic elements of entrepreneurship and initial phases of planning, including legal, financial, marketing, control organization, and management functions. To provide realism, actual cases involving small businesses will be used with background text. *Prereq.* 45.301.

45.324 Entrepreneurship and Small Business Management II (3 q.h.)

This course is intended as a follow-up to Small Business Management I and is a course for advanced business students. Emphasis will be placed upon developing business plans, analyzing performance, problem identification, maintaining financial health, and planning for the future. Actual cases involving small businesses will be used in conjunction with background reading. *Prereq.* 45.323.

45.325 Entrepreneurship and Small Business Management (Intensive) (6 q.h.)

Same as 45.323 and 45.324. Not open to students who have taken those courses.

Industrial Management

Consultant: Mr. J. M. Rosenfeld (969-4783)

Coordinator: Mr. J. D. Mukjian (268-9800)

45.400 Production Management and Manufacturing Systems I (3 q.h.)

To acquaint students with the broad range of activities that occur in production facilities, this course introduces students to organization principles, to matters concerning the manufacturing system, the choice of equipment, and the location and layout of the plant. It deals with product and process development, setting quality and production standards, plant production schedules, and the production flow through the transformation process. Emphasis is placed on manufacturing costs, product quality, and the system's delivery performance.

45.401 Production Management and Manufacturing Systems II (3 q.h.)

Selected readings in modern production management techniques. Facilities planning and design including plant layout, materials handling, and related equipment. Engineering economy. *Prereq.* 45.400.

45.402 Production Management and Manufacturing Systems (Intensive) (6 q.h.)

Same as 45.400 and 45.401. Not open to students who have taken those courses.

45.403 Manufacturing Processes (3 q.h.)

Production processes and material selection in the production and manufacture of hard goods, including selection of best methods by study of casting, machinery, forming, joining, extrusion, finishing, and assembly. The analysis of advanced manufacturing processes, including mass production, numeric control, central vs. line layout systems, automated systems, computer control equipment and systems, equipment and machinery selection, and replacement policies.

45.404 Value Management (3 q.h.)

An organized technique for challenging costs by analyzing a product or method in terms of value, function, and costs without sacrificing essential quality.

45.405 Industrial Safety (3 q.h.)

A study of the organization and administration of a comprehensive accident-prevention program, including analysis of industrial hazards and accidents, corrective actions, and the responsibilities of all management echelons, from the safety engineer to top management.

45.406 Methods Analysis, Motion and Time Study (3 q.h.)

Methods analysis and plant layout; work design, operation analysis, man-machine relationship; elements of motion and time study. Measurement techniques and application. Production standards development for job shop operations, applying curve, table, equation, nomograph, family, and multivariables techniques, and utilizing work sampling methods.

45.407 Operations Management (3 q.h.)

Develop student skills in analyzing and managing the operations of a manufacturing operation. Integrates the techniques and methods, both quantitative and qualitative points of view, and applies them to problems that arise in planning and controlling manufacturing and other operating systems.

45.409 Cases in Industrial Management (3 q.h.)

Cases describing particular operating situations as they are faced by managers in business in which the students base their analyses on an array of facts and judgments. The student will become aware of the skills the manager brings to bear on business problems requiring a diverse background of knowledge about the technologies and techniques of the field. The basic disciplines in the quantitative and behavioral sciences and an understanding of the specific situational context are integrated. Cases are designed to provide the necessary background in topics specifically relevant to production problems.

45.410 Production Control and Inventory Management (3 q.h.)

Theory and practice of the economic control of inventories is developed. A broad spectrum of models for production control and inventory management is examined. Solutions are sought by analytical methods and by numerical simulation. Goals include bringing the range of concept and techniques to the point of useful application in practical design.

45.411 Industrial Decision Making I (3 q.h.)

An application-oriented introduction to prescriptive decision analysis. The development of a systematic approach to problem solving and decision making; decision theory; structure of human decisions. Modeling of the decisions process. *Prereq.* 10.533.

45.412 Industrial Decision Making II (3 q.h.)

Application of probability and utility theory, psychology, and economics to the decision process. Topics covered include the perception of options, uncertainties, and objectives, decision trees, and other modes of representation. Criteria of choice including preference and utility, attitude toward risk, expected value. Practical usefulness of techniques with application to career planning, job and organization design and managerial effectiveness. Survey of current practices, real world cases. *Prereq.* 45.411.

45.413 Manufacturing Seminar I (3 q.h.)

Problems of manufacturing operations at the plant manager level, analysis of manufacturing problems, including controls of the manufacturing process; selected case studies. *Prereq.* 45.403, 45.410.

45.414 Materials Management (3 q.h.)

The development and examination of materials management, including objectives, organization, and functions as they relate to cost improvement, investment control, and ability to serve the market; materials system; selected case studies.

45.416 Manufacturing Seminar II (3 q.h.)

The student pursues a program of independent study on an approved topic in a particular area of Industrial Management under the supervision of a faculty member. *Prereq.* 45.413.

45.417 Industry and the Environment I (3 q.h.)

Features in-depth analyses of situations where economic interests and environmental concerns are in conflict. The course reviews the operation of the capitalistic system as a foundation for examining the resultant ecological risks associated with chemicals, strip-mining, and super-tankers.

45.418 Industry and the Environment II (3 q.h.)

The thoughts of Amory Lovins and E.F. Schumacher serve as the basis for examining the economic benefits associated with energy conservation, alternative energy systems, and solid waste recovery systems. *Prereq.* 45.417.

45.419 Managing for Results (3 q.h.)

This course serves as a forum for the discussion of the wide ranging theories of Peter Drucker. Emphasis is placed on the concepts and methods available to the result-oriented manager. Topics are derived from selected writings of Drucker. Relationships between theory and practice including implementation will be established.

Purchasing

Coordinator: Mr. G. E. Maguire (272-4000 ext. 3633)

45.451 Purchasing I (3 q.h.)

An introduction to the function of purchasing in the industrial organization. The span of purchasing responsibilities, objectives, organization, and personnel requirements. Purchasing policy and systems. The role of the computer in regulating purchasing planning, transactions, and information retrieval. Acquisition of purchased materials, development of sources of supply, and assurance of materials quality. Determination and maintenance of required inventory levels. Control of inventory investment, price determination, cost and price analysis of purchase transactions. Make or buy decisions. Role of standardization and value analysis.

45.452 Purchasing II (3 q.h.)

The process of purchase negotiations, budgets, purchase of capital equipment. Purchasing for public and non-profit institutions. Disposition of surplus and obsolete materials. Traffic and material handling. Forward buying and speculation. Ethical considerations in purchasing. Purchasing law, contract cancellations, purchasing reports, and evaluation of purchasing performance. Control and audit procedures. *Prereq.* 45.451.

45.453 Purchasing (Intensive) (6 q.h.)

Same as 45.451 and 45.452. Not open to students who have taken those courses.

45.455 The Materials Acquisition Function (3 q.h.)

A survey of the procurement function as found in industry. This course is designed to furnish students with a broad comprehension of the acquisition function. The mission, procedures, and interfacing of purchasing with other functions and its legitimate objectives are explored. Systems techniques, organizational structures and required skills are investigated with particular attention given to the integration of this function into the total cycle of product creation.

45.456 Administration of Purchasing Contracts (3 q.h.)

Nature of the legal commitment between buyer and seller. Obligations and rights of both parties. The basis of purchasing agency and the sources of public authority which regulate the purchasing contract. The elements of an enforceable claim. Purchasing contracts, expressed and implied, warranties. Patent rights and their legal restrictions on purchasing transactions. Elements of the Uniform Commercial Code and its impact on buyer-seller relationships. Contract requirements, changes, and cancellations. *Prereq.* 45.451.

45.457 The Art and Techniques of Purchasing Negotiation (3 q.h.)

The process of buyer/seller communication and exchange in arriving at sound purchasing transactions. This course explores the reasons for choosing this negotiation, interactive process for arriving at a more satisfactory agreement between buyer and prospective vendor. Accepted strategies and tactics employed by both parties as effective means of achieving legitimate objectives in industrial purchasing activity. Economic and technical considerations are discussed. Psychological and interpersonal environment of the negotiating situation are explored in detail. Students have an opportunity to engage in workshop demonstrations of effective negotiating practice. *Prereq.* 45.451.

45.458 Materials Requirements Planning (3 q.h.)

Analyses a new process (MRP) for integrating and organizing purchasing and inventory management functions. System is based on production schedule requirements and variations rather than on historical data. System aims at assisting the process of capacity planning for maximum manufacturing efficiency. MRP provides a rational base for economical procurement planning and control. Concentration on MRP's unique concepts for managing material supply activity and other related, critical operating problems.

47—REAL ESTATE

Consultant: Mr. John P. Driscoll, Esq. (933-2242)

47.320 Real Estate Fundamentals I (3 q.h.)

An introduction to the basic principles and terminology of real estate to serve as a background for application in the various practices of the real estate business. (Replaces 47.301)

47.321 Real Estate Fundamentals II (3 q.h.)

A general examination of the practices of real estate brokerage (including the preparation for the broker's or sales person's state exam), real estate appraisal, finance, development, management, and investment. *Prereq.* 47.320. (Replaces 47.302)

NOTE: Real Estate Fundamentals III, 47.303 is no longer offered.

47.322 Real Estate Fundamentals (Intensive) (6 q.h.)

Same as 47.320 and 47.321. Not open to students who have taken those courses.

47.323 Real Estate Appraisal I (3 q.h.)

A fundamental course in the appraisal of single family residences; analysis of city or town neighborhood influences, site evaluation, building diagnosis, depreciation; study of the various approaches to value; appraisal report preparation. *Prereq.* 47.321. (Replaces 47.306)

47.324 Real Estate Appraisal II (3 q.h.)

A specialized course in the appraisal of income properties; application of the cost, market and income approaches to apartment buildings, other commercial and industrial properties. *Prereq.* 47.323. (Replaces 47.307)

47.325 Real Estate Appraisal III (3 q.h.)

A continuation of Real Estate Appraisal II with special emphasis on the application of the various methods of capitalization and residual techniques. Repeated classroom problems, assigned exercises, case studies and field trips will be employed. *Prereq.* 47.324. (Replaces 47.308)

47.326 Advanced Real Estate Appraisal I (3 q.h.)

An advanced course in the evaluation of multi-family residential and other income properties, with special attention to advanced appraisal techniques, including the Ellwood and Akerson Tables. Case studies will be scheduled as well as field trips involving actual appraisal problems. *Prereq.* 47.325 or permission of instructor. (Replaces 47.309)

47.327 Advanced Real Estate Appraisal II (3 q.h.)

A continuation of Advanced Real Estate Appraisal I, with emphasis on feasibility analysis, using current advanced techniques and decision theory analysis. Case studies and field trips will be scheduled. *Prereq.* 47.326. (Replaces 47.310)

47.328 Real Estate Financial Analysis I (3 q.h.)

Provides the tools which permit the student to critically examine and analyze the viability of any proposed real estate investment. Examines in detail, the financial aspects of acquisition, ownership, and disposition. Considers taxation of investments, forms of property ownership (organization of the venture), analysis of operating statements, financial accounting, use of leverage, "tax-sheltered" investments, special situations and other considerations. Develops criteria of risk and return on investment (R.O.I.) which should be established by various types of investors. *Prereq.* 47.325 or *permission of instructor.* (Replaces 47.304)

47.329 Real Estate Financial Analysis II (3 q.h.)

A detailed analysis of the risks and rewards of real investments, problems involved in financing income properties, with emphasis on the use of case studies, homework problems, class discussion and debate. Class participation is stressed. *Prereq.* 47.328. (Replaces 47.305)

47.330 Real Estate Development (3 q.h.)

A practical step-by-step approach to the organization and development of a real estate project for the entrepreneur, banker, or broker. Topics include the role of the developer; acquisition of land; site analysis; construction finance; gap financing and permanent commitments; project budgeting for capital costs and for income and expense; selection of professionals; negotiations of agreements with contractors and owners; marketing the completed project. Case studies and guest lecturers may be used. *Prereq.* 47.329 or *permission of instructor.* (Replaces 47.311)

47.331 Real Estate Law I (3 q.h.)

This course concentrates on private real estate law including ownership rights in land; leasehold rights and easements in the land of another; legal forms of ownership; the transfer and acquisition of title and of other interests; recording of deeds, leases and other instruments; the landlord/tenants relationship. (Replaces 47.312)

47.332 Real Estate Law II (3 q.h.)

This course concentrates on public real estate law including government powers, rights and controls on privately owned real estate; zoning and subdivision controls; conservation controls; taxation of real estate; rent controls, eminent domain. (Replaces 47.313)

47.333 Real Estate Law III (3 q.h.)

This course is a continuation of Real Estate Law II with emphasis on case study method. Class participation and discussion are stressed. (Replaces 47.314)

47.334 Real Estate Management I (3 q.h.)

This course is designed to prepare the student for the practical problems of real estate management. Stresses the requisite day-to-day management of commercial, in-

dustrial, and residential properties as well as the need for a management strategy as it relates to long-term property values. *Prereq.* 47.321 or permission of instructor. (Replaces 47.316)

47.335 Real Estate Management II (3 q.h.)

Continuation of 47.334. *Prereq.* 47.334. (Replaces 47.317)

47.336 Real Estate Management III (3 q.h.)

Continuation of 47.335. *Prereq.* 47.335. (Replaces 47.318)

47.337 Real Estate Title Examination (3 q.h.)

A specialized course dealing with the examination of title to real estate and with the preparation of a complete report. *Prereq.* 47.321 or permission of instructor. (Replaces 47.319)

48—TRANSPORTATION AND PHYSICAL DISTRIBUTION MANAGEMENT

Consultant: Dr. R. C. Lieb (College of Business Admin.) (437-3236)

48.301 Elements of Transportation (3 q.h.)

An introduction to regulatory, economic, and management aspects of transportation from the viewpoint of shippers, government, and carrier management. Topics include: cost, rates, operations, entry, mergers, and intercity passenger carriage. A course of general interest to students of business, law, or government.

48.302 Physical Distribution Management (3 q.h.)

An introduction to the physical distribution management concept. Topics include inventory control, warehousing, cost control, and locational strategy. Course uses text and case materials developed from industry situations.

48.303 Organization and Control of Physical Distribution Management (3 q.h.)

Establishment of the firm's physical distribution organization. Interrelationships with other company functions. Examination of advanced physical distribution problems.

48.304 Management of Warehouse Operations (3 q.h.)

A practical course in the management of warehouses. Topics include: site selection, construction, finance, operations, measurement of performance, and warehouse technology.

48.305 Traffic Management I—Rates and Tariffs (3 q.h.)

A practical course in the interpretation and use of tariffs. Topics include classifications, rate scales, tariff rules, rate-making procedures, and ICC law and practice.

48.306 Traffic Management II—Selected Topics (3 q.h.)

Further study of traffic management covering such topics as routing, claims, insurance, consolidation, and packaging. *Prereq.* 48.305.

48.307 Contemporary Issues in Transportation and Distribution (3 q.h.)

This course focuses attention on a limited number of topics which are of particular interest during the current academic year.

48.308 Transportation Regulation and Promotion I (3 q.h.)

Study of the history and content of the Interstate Commerce Act.

48.309 Transportation Regulation and Promotion II (3 q.h.)

Study of administrative law and procedures, the code of ethics, and general rules of practice. Analysis of cases pertinent to the Commerce Clause. Preparation for the ICC Practitioners Exam. *Prereq.* 48.308.

48.310 Surface Transportation I—Railroad Management (3 q.h.)

A management-oriented course that considers the current and future status of the railroads. Topics include: investment and finance, mergers, marketing, labor relations, diversification, and public policy.

48.311 Surface Transportation II—Motor Carrier Management (3 q.h.)

A management-oriented course that examines the regulated motor carrier industry. Topics include: equipment selection, finance, mergers, marketing, labor relations, routes, operations and control, and public policy.

48.312 Surface Transportation III—Marine Transportation (3 q.h.)

A management-oriented course that examines the U.S. Merchant Marine. Topics include: international trade patterns, government promotion and regulation, technological innovations, port facilities, and labor relations. Offered 1978-79.

48.313 Surface Transportation IV—Private Trucking (3 q.h.)

Beginning a private trucking operation. Topics include: legal guidelines, purchase versus lease, operations, and performance measurement. Offered 1978-79.

48.314 Air Transportation (3 q. h.)

Economics and regulation of Civil Aeronautics Board certified air carriage. Topics include: entry, operations, pricing, mergers, cost analysis, and financing.

48.315 Urban Transportation (3 q.h.)

The scope and status of transportation in our metropolitan area. Examination of the planning and financing of urban transportation systems. The role of local, state, and federal government units. The problems of transit management. Offered 1978-79.

48.316 Carrier Management (3 q.h.)

The transportation system from the carrier viewpoint; managerial response to a heavily regulated and rapidly expanding environment; focus on carrier decision making including routes, scheduling, financing, and pricing of services. Offered 1978-79.

49—LAW

Consultant: Mr. H. Olins, Esq. (482-6998)

49.301 Law I (3 q.h.)

Introduction to the legal system; study of the nature formation, and essential elements of contracts, including performance and remedies for breach. Analysis of the law of agency, including creation, rights, and duties of principal and agent, scope of authority, relationships to third persons, termination of agency.

49.302 Law II (3 q.h.)

Principles and problems associated with the following areas of business law:

Personal property—its nature and characteristics.

Sales—nature of sales and law of sales.

Landlord and tenant—respective rights and duties.

Commercial paper—negotiability, negotiations, checks and notes.

Bankruptcy—outline of federal bankruptcy, its application and administration.

Business organization—analysis of the corporation, partnerships, and other forms of business organizations. *Prereq.* 49.301.

49.303 Law (Intensive) (6 q.h.)

Introduction to the legal system; study of the nature, formation, and essential elements of contracts, including performance and remedies for breach. Analysis of the law of agency, including creation, rights, and duties of principal and agent, scope of authority, relationships to third persons, termination of agency.

Principles and problems associated with the following areas of business law:

Personal property—its nature and characteristics.

Sales—nature of sales and law of sales.

Landlord and tenant—respective rights and duties.

Commercial paper—negotiability, negotiations, checks and notes.

Bankruptcy—outline of federal bankruptcy, its application and administration.

Business organization—analysis of the corporation, partnerships and other forms of business organizations.

49.304 Law and Social Issues (3 q.h.)

A study of the structure and dynamics of the American legal system approached through an analysis of selected cases dealing with social issues.

Management Information Systems

Consultant: Mr. T. J. McNamara (890-8400 x2047)

Coordinator (EDP): Mr. T. Kelly (726-2273)

Associate Consultant (Programming): Mr. J. Sullivan (727-1550)

49.310 Electronic Data Processing I (3 q.h.)

An introduction to computers including discussion of numbering and coding systems; overview of typical business applications, flowcharting, and basic programming concepts. A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; presentation of COBOL and other programming languages.

49.311 Electronic Data Processing II (3 q.h.)

A more complete study of the use of data processing techniques in specific business applications; includes data communications concepts and terminals, time sharing, mini- and micro-processing, distributed processing, and other trends in EDP. *Prereq.* 49.310.

49.314 Electronic Data Processing (Intensive) (6 q.h.)

Intensifies material of EDP I and EDP II into a single quarter by doubling frequency of class meetings and pace of non-class work.

49.320 COBOL For Non-Programmers (3 q.h.)

A one-quarter introductory computer programming course for business students. Fundamentals of computer programming are introduced along with COBOL, Common Business Oriented Language. The divisions of COBOL, data file structures, and verb actions are studied. Each student will prepare and check out several programs using the University Computer Center. *Prereq.* 49.311.

49.321 COBOL Programming I (3 q.h.)

Fundamentals in computer programming for business applications are introduced. COBOL, Common Business Oriented Language, the standard business programming language of EDP, is studied. Principles of flowcharting, as well as input and output formats, are studied. Programs prepared by the student are run and checked out, using the University Computer Center or a computer available to the student. *Prereq.* 49.311 or 49.314.

49.322 COBOL Programming II (3 q.h.)

Programming in COBOL is presented in more detail. Business data processing functions of input editing, record processing, and output editing are illustrated and implemented in programs prepared and run on the University's computer. Student programs utilize punch card input and line printer for output. *Prereq.* 49.320 or 49.321.

49.323 COBOL Programming III (3 q.h.)

More sophisticated computer programming techniques are applied to the solution of more complex business application problems. Different techniques and approaches are discussed, e.g. top-down design will be discussed and structured programming techniques will be practiced. Meetings are divided into lectures and computer problems-solving sessions. File processing problems in magnetic disk and magnetic tape are presented. COBOL subroutines and sort techniques are studied. *Prereq.* 49.322.

49.339 COBOL Programming (Intensive) (9 q.h.)

Intensifies material of 49.321, 49.322, and 49.323 into a single quarter by meeting twice a week for three hours per session. The pace of non-class work is also intensified. *Prereq.* 49.311.

49.324 Assembly Programming I (3 q.h.)

Introduction to assembler language programming using the University's computing system. Organization, representation, and processing data within the computer. Looping, instruction modification, indexing, indirect addressing, and data retrieval are introduced. cursory survey of assembler languages in general. *Prereq.* *Demonstrated familiarity with any currently available computer language.*

49.325 Assembly Programming II (3 q.h.)

Further exploration of assembler language techniques, other addressing structures, floating point techniques, coding, and use of macro instructions. Input-output routines, use of operating systems for job scheduling, resource allocation, file handling. Business problems analyzed, flowcharted, programmed, and debugged on the University's computer by students. Debugging of problems by core dump analysis. *Prereq.* 49.324.

49.326 Assembly Programming III (3 q.h.)

Utilization of business data processing hardware on the University's computing system. Further use of operating system, divide independent file handling. Blocked and unblocked file manipulation. Application of assembler language to a sophisticated programming project. *Prereq. 49.325.*

49.327 FORTRAN Programming I (3 q.h.)

Designed to give the opportunity to the student to gain a working knowledge of FORTRAN, the modern problem oriented computer language. Enables the professional to understand the use of a computer in solving problems in business, mathematics, and the social and physical sciences by introducing him or her to problems in selected applications and illustrating use of FORTRAN in finding solutions. *Prereq. 49.311 or 49.314.*

49.328 FORTRAN Programming II (3 q.h.)

The course helps provide the student with practical experience in the use of FORTRAN in solving significant problems in business, mathematics, and the social and physical sciences. Problems of sufficient complexity are used to allow the student to actively participate in the various steps necessary to analyze, define, document, and solve the problem using FORTRAN. *Prereq. 49.327.*

49.329 FORTRAN Programming III (3 q.h.)

A sophisticated set of problems is presented to teams of students for solution. Consultations with instructor allow students to actively participate in solving problems with the use of FORTRAN. *Prereq. 49.328.*

49.330 RPG Programming (3 q.h.)

A working knowledge of the Report Program Generation language. This language is suited to small scale computer usage for such tasks as: report generations; file updating; various utility functions. Students write the debug class problems using a University computer or a computer available to the student. *Prereq. 49.311 or 49.314.*

49.331 Computer Operating Systems I (3 q.h.)

Survey-type course describing operating systems and investigating the full range of systems services available under computer operating systems. Special emphasis is placed on their value as tools for developing management information. (Note: This quarter could stand alone as management tool for decision making.) *Prereq. 49.323.*

49.332 Computer Operating Systems II (3 q.h.)

Specific software covered is systems supervisor, data management system, FORTRAN, COBOL, PL/1, and special purpose compilers. Also investigated are operating systems which accommodate network analysis, pert systems, simulation packages, and statistical analysis packages. Detailed analysis on data management systems with specific case studies and development of operating system programs. *Prereq. 49.331*

49.333 Mini Computers in Business I (3 q.h.)

An introduction to the application of minicomputers in the business environment. Topics covered include: analysis of cost/performance; systems consideration of minis versus alternatives; role of minis in a variety of applications such as: time shar-

ing, intelligent terminals, data entry and gathering, data communications, and others. Emphasis is placed on evaluation of minis as cost-effective elements of a business system. *Prereq.* 49.321, 49.363.

49.334 Mini Computers in Business II (3 q.h.)

Development of system specifications, functional configurations, systems tradeoffs, site preparation, and maintenance considerations. Detailed analysis of systems with specific case studies related to business applications. *Prereq.* 49.333.

49.336 Data-Base Systems (3 q.h.)

An introduction to data-base approach to the design of integrated information applications. Data-base design, data structures, diagramming, CODASYL data definition language, data manipulation language, data-base implementation and evaluation. *Prereq.* 49.322, 49.361.

49.340 BASIC Programming (3 q.h.)

An introductory level course in computer programming using the language BASIC. Beginners All-purpose Symbolic Instruction Code is an easily learned, comprehensive language that will allow students to begin using EDP methods in problem solving. Students will write, debug, and execute a number of individual and class projects using the University Computing System. BASIC is a programming language that lends itself well to execution from "off-site" terminal hardware.

49.360 Systems Analysis and Design I (3 q.h.)

A study of some of the techniques used in systems analysis and design as well as the study of how to use them effectively. It includes a look at the human factors in systems including the concepts of leadership and power; the identification and resolution of conflict. In addition, it covers data collection techniques, system flow-charting and narratives and proper interviewing tapes, including note-taking, listening, and report preparation. *Prereq.* 49.311.

49.361 Systems Analysis and Design II (3 q.h.)

This quarter builds upon what was studied in Systems Analysis and Design I. It includes techniques in work measurement; work simplification; writing and maintenance of manuals. In addition, the course covers system documentation, user involvement, and user training. Case studies will be used when appropriate. *Prereq.* 49.360.

49.362 Systems Analysis and Design III (3 q.h.)

This quarter covers the use of computers and other electronic data processing concepts in a total system. It covers input preparation including OCR, on-line terminals; processing including multiprogramming, mini-computers, micro-computers; file design and storage; output possibilities including COM, audio and video. It discusses the pros and cons of the differing alternatives and helps the student make a reasonable choice in each case. *Prereq.* 49.361.

49.363 Systems Analysis and Design IV (3 q.h.)

This final quarter studies "varying advanced techniques" and their uses in systems work. It covers data communications including data flow, network design, terminal selection, tariffs, and costing. In addition, there is a study of time-sharing and operations research techniques as well as the study of specific business systems. *Prereq.* 49.362.

49.375 Systems Analysis and Design (Intensive) (6 q.h.)

Same as 49.360 and 49.361. Not open to students who have taken those courses.

49.364 Data Systems Administration (3 q.h.)

The major phases involved in the study and detailed planning for effective use of data processing equipment and management sciences in meeting the information needs of business, including the analysis of company objectives, feasibility study, system specifications, equipment selection, and implementation of the new system. *Prereq.* 49.311 or 49.314.

49.365 Business Data Processing Applications I (3 q.h.)

Each student is given an opportunity to understand and perceive a company as a total operating system. Specific systems applications examined include inventory control, purchasing, accounts payable, and their integration. Specific techniques on data collection including data communications are dealt with during the quarter. A field trip to a communications training center and a team case study project complete the quarter. *Prereq.* 49.364.

49.366 Business Data Processing Applications II (3 q.h.)

A continuation of 49.365, covering additional information systems of accounts receivable, sales analysis, the design of integrated systems, a review of "on-line" systems, and computer system simulation. The opportunity to participate in a computer simulation exercise is offered during a field trip. A team case study project completes the quarter. *Prereq.* 49.365.

49.367 Senior Seminar I (3 q.h.)

This course offered to the advanced student consists of discussion topics, research projects, and cases in the field of electronic data processing and management information systems. Students work in teams on real-life projects with scheduled formal written reports and presentations. Also included are a number of lectures illustrating the systems requirements and implementation of unusual or state-of-the-art business applications. *Prereq.* 49.311, 49.365, 49.366.

49.368 Senior Seminar II (3 q.h.)

A continuation of Senior Seminar I. *Prereq.* 49.367.

49.369 Auditing Data Processing (3 q.h.)

A general presentation of auditing techniques used when auditing typical EDP installations. Functional assignment of duties within an EDP installation. Control over input and output, and processing itself. Methodology of safeguarding record files against physical and/or authorized use. Internal control, hardware checks, system checks, and audit trails are discussed. Auditing around the computer versus through the computer. Using the computer to test the data processing system and also the records produced by the computer system. Auditing advanced data processing systems. *Prereq.* 49.310 or 49.314.

49.373 Information Processing in Medicine (3 q.h.)

A non-technical survey of the impact and potential of computers in medicine: medical records; clinical reporting systems; automated laboratories; on-line monitoring; research needs; medical administration requirements. Analysis of the content and interactions of medical information sub-systems. Implications of computerization

of various medical activities; equipment selection; organizational considerations. *Prereq.* 49.310 or 49.314.

49.376 Privacy and Security (3 q.h.)

Clarification of the issues of computer privacy, security, and confidentiality with emphasis on computer security. Review of past violations of privacy, security, and potential threats. Development of security approaches, techniques, and methods of implementing security. *Prereq.* 49.310 or 49.314. (*Replaces* 49.337)

Quality Control And Management Sciences

Associate Consultant: Prof. R. A. Parsons (College of Business Administration) (437-3255)

49.380 Introduction to Operations Research (3 q.h.)

Mathematical programming; linear programming; graphical, Simplex, and transportation models; sensitivity analysis; the dual, degeneracy, integer programming; non-linear programming.

49.381 Operations Research Applications (3 q.h.)

Special topics including decision making under uncertainty; decision tree analysis; dynamic programming, queuing theory, PERT-CPM and simulation. *Prereq.* 49.380.

49.382 Statistical Quality Control (3 q.h.)

Description and practical application of the basic statistical quality control methods for quality assurance, quality control, and quality improvement of products and services; the determination of process capability; the use of quality control charts for measurable and non-measurable quality characteristics; application of statistical and probability considerations in acceptance sampling of purchased material, work in process, and outgoing products; methods of predicting sampling results using the hyper-geometric, the binomial, and the Poisson distributions; risks involved in sampling and concepts of AQL, RQL, and AOQL. *Prereq.* 39.313.

49.383 Management of Quality Control (3 q.h.)

Modern concepts of managing the quality control function of a company to maximize customer satisfaction at minimum quality cost; the idea of total quality control; measurement of the cost of quality, development of a coordinate program of improvement, organizing for diagnosis of defect causes. *Prereq.* 49.382.

49.384 Advanced Quality Control (3 q.h.)

Detailed study of specialized techniques used in defect-cause diagnosis and problem analysis. Complete analysis of process capability; the multi-vari chart; pictograms; the span plan method; special emphasis on design of control plans for process quality control and special cases of product acceptance. *Prereq.* 49.383.

49.385 Principles of Material Inspection (3 q.h.)

An operating and technical-level course involving mensuration, need, and function of inspection and specifications; basic principles and techniques of measurements; various methods and equipment used for gauging and measuring; special measuring and inspection problems.

49.386 Industrial Experimentation (3 q.h.)

Modern small sample techniques are applied to industrial problems. Use of statistical inference to make estimates and set confidence intervals of key characteristics of production lots and processes; design of single- and multiple-factor experiments; tests of significance; analysis of variance. Correlation techniques; experimental design, balancing and randomizing techniques; factorial designs; nested designs; Latin square; random balance/multiple-balance. *Prereq.* 39.313.

49.387 Quality Control and Management (Intensive) (6 q.h.)

Same as 49.381 and 49.383. Not open to students who have taken those courses. *Prereq.* 39.313.

Personnel and Industrial Relations

Consultant: Prof. Christine L. Hobart, College of Business Administration (437-3257)

Associate Consultant (Industrial Labor Relations): Mr. D.F. Hurley (785-0484)

Associate Consultant (Personnel Relations): Mr. R.E. Guittarr (475-5000)

49.400 Human Relations in Organizations I (3 q.h.)

Emphasizes the expanding popularity of human relations, describing participation, formal and informal organization concepts, and leadership patterns.

49.401 Human Relations in Organizations II (3 q.h.)

Provides a review of the processes of communication, appraisal of performance, and accomplishment of change. Classes are highly participative with emphasis on case discussion as related to text material. *Prereq.* 49.400.

49.402 Human Relations in Organizations (Intensive) (6 q.h.)

Same as 49.400 and 49.401. Not open to students who have taken those courses.

49.403 Advanced Human Relations (3 q.h.)

A seminar to discuss the theories of human effectiveness. An amplification of topics surveyed in Human Relations I and II, emphasizing their practical application to present-day management of business enterprises. Reviews the implications of such theories as the managerial grid, Theory X, Y, maintenance vs. motivation. *Prereq.* 49.401 or equiv.

49.404 Personnel Management I (3 q.h.)

Organization, function, and procedures of the personnel department in relationship to the management organization; manpower selection; training; rating; personnel policies, benefits, and reports.

49.405 Personnel Management II (3 q.h.)

Principles and techniques of training, the psychology of learning, meeting training needs, principles and practices of organizing training activities. *Prereq.* 49.404.

49.406 Personnel Management III (3 q.h.)

Controlling and coordinating the managerial responsibility of supervision; planning the work; employee assignments; employee attitudes; employee grievances; administering company policies, developing work interest. *Prereq.* 49.405.

49.407 Techniques of Employee Selection (3 q.h.)

Recruitment, selection, and placement techniques including interviewing, employment testing, and examining.

49.408 Wage and Salary Administration (3 q.h.)

Wage and salary determination; merit and incentive plans; wage and salary structure; compensation methods; impact on employer-employee relations in the economy. *Prereq.* 49.407.

49.409 Employee Benefits (3 q.h.)

Private and public programs directed to job and worker income security; unemployment compensation; training and employment services; private guaranteed income; retirement pension plans and disability; group insurance.

49.410 Job Evaluation (3 q.h.)

Wage-payment systems; theory of wage determination, job elements, rating scales, writing job descriptions and specifications; selection of plans; development of wage structures and integration with the principles of merit rating.

49.411 Creative Problem Solving (3 q.h.)

New ways of thinking are learned and practiced. Sensing and analyzing problems, producing ideas, evaluating and implementing solutions. The attitudes and climate conducive to creative thinking as well as common barriers are presented. Provides methods for developing imagination, which is the key part of the creative process.

49.412 Group Dynamics I (3 q.h.)

Students explore the theoretical and practical applications of group dynamics to their current and future work situations. Outside readings, observations of groups, and journal-keeping techniques are employed to assist in class participation. Emphasis is placed upon the student as a group member, the understanding of group processes, and the individual as a change agent.

49.413 Group Dynamics II (3 q.h.)

A continuation of 49.412. *Prereq.* 49.412.

49.414 Group Dynamics III (3 q.h.)

A continuation of 49.413. *Prereq.* 49.413.

49.420 Labor Management Relations I (3 q.h.)

The origin and development of labor unions in the United States; an examination of the structure, policies, and goals of unions; the legal framework of collective bargaining including employer and union impacting on bargaining as prescribed and proscribed by the Railway Labor Act, the Labor Management Relations Act, and anti-trust restrictions; the process and issues in collective bargaining. *Prereq.* 39.303.

49.421 Labor Management Relations II (3 q.h.)

An examination of selected parts of a collective bargaining contract such as seniority, subcontracting, and union security; labor supply and demand; the impact of unions and collective bargaining; employment, wages, and income. *Prereq.* 49.420.

49.422 Labor Management Relations (Intensive) (6 q.h.)

Same as 49.420 and 49.421. Not open to students who have taken those courses. *Prereq.* 39.303.

49.423 Legal Standards for the Workplace I (3 q.h.)

Constitutional problems involving "police powers" and "due process" in the enactment of state and federal legislation as to minimum wages, hours, child labor, etc. and application of such laws; 1964 Civil Rights Act and its effect in these areas; Fair Labor Standards Act and Equal Pay Act. *Prereq.* 49.421.

49.424 Legal Standards for the Workplace II (3 q.h.)

Continuation of 49.423 with respect to the Age Discrimination Act, Occupational Safety and Health Act, Workmen's Compensation Act, Employment Compensation Act, and Social Security. *Prereq.* 49.423.

49.425 Legal Standards for the Workplace III (3 q.h.)

Emphasis on Veterans Reemployment Rights and Employee Retirement and Income Security Act; coordination and current rulings and case update of the anti-discrimination standards and rulings in terms of race, creed, color, sex, and age. *Prereq.* 49.424.

49.426 New Patterns of Collective Bargaining I (3 q.h.)

An in-depth examination of the basic provisions of a collective bargaining contract including grievance processing; simulated bargaining of contract from preparation of demands to agreement using problem-solving techniques of mediation, fact finding, and arbitration of selected grievances. *Prereq.* 49.421.

49.427 New Patterns of Collective Bargaining II (3 q.h.)

A limited survey of Labor Relations on an international level as to the structure of bargaining, the participation of governments in the bargaining process. This survey is used as a basis of comparison to examine current labor-management issues in the United States such as dispute settlement, wage policies, public employee and professional collective bargaining, etc. *Prereq.* 49.426.

BUSINESS ADMINISTRATION INTENSIVE COURSES

41.304 Accounting Principles (Intensive) (6 q.h.)

Same as Accounting Principles I and II.

41.309 Accounting for Management Decisions (Intensive) (6 q.h.)

Same as Accounting for Management Decisions I and II. *Prereq.* 41.302.

41.404 Intermediate Accounting (Intensive) (6 q.h.)

Same as Intermediate Accounting I and II. *Prereq.* 41.302.

41.414 Auditing (Intensive) (6 q.h.)

Same as Auditing I and II. *Prereq.* 41.403.

43.303 Introduction to Marketing (Intensive) (6 q.h.)

An overview and introduction to marketing and marketing management in the company and in society based upon text readings. The emphasis on distribution channels, pricing, product planning, packaging, branding, physical distribution, and marketing communications enables the student to use case work in developing the strategies necessary to cope with marketing functions and the problems faced both within the industry and in reaction to consumer attitudes and behavior.

43.330 Advertising and Sales Promotion (Intensive) (6 q.h.)

Principles of advertising and sales promotion and their function as communications and motivational forces in the marketing mix. Includes text material, cases, field assignments and relevant projects. Covers the creative process, the use of written, audio and visual media, the elements of the promotional mix and the selection of advertising and sales promotion strategies to support sales and marketing goals. *Prereq. 43.302 or 43.303.*

43.331 Sales Management (Intensive) (6 q.h.)

Comprehensive study of the principles and strategies of effective sales management. Combines readings, case studies, field assignments and projects. Covers organization, selection supervision, evaluation and management of the sales force, and the role of sales operations in the planning and execution of marketing strategy. *Prereq. 43.302 or 43.303.*

43.332 Retail Management (Intensive) (6 q.h.)

Concentrated, in-depth study and analysis of the retailing structure, its operations, its management, and its future. Includes text material, case studies, field assignments and projects. Covers all types of retailing: independents, chains, supermarkets, mass merchandising, department stores, speciality stores. Topics included are merchandising, pricing, buying, promotion, location, store planning, profitability and operations. *Prereq. 43.302 or 43.303.*

43.333 Salesmanship (Intensive) (6 q.h.)

Principles and techniques of selling. Stresses the role of the individual and how he or she can motivate others. Combines text materials, field assignments, case studies and projects. Covers personal selling as required for both products and services (tangible and intangible), and as required for sales through all channels of distribution as well as direct. Industrial and consumer products included. *Prereq. 43.302 or 43.303.*

43.336 Marketing Management (Intensive) (6 q.h.)

Same as 43.334, 43.335. Not open to students who have taken those courses.

44.327 Personal Financial Management (Intensive) (6 q.h.)

A one-quarter course covering the same material found in Personal Financial Management I and II. *Prereq. 44.301.*

44.331 Financial Management (Intensive) (6 q.h.)

A one-quarter course covering the same material found in Financial Management I and II. *Prereq. 44.301.*

44.332 Investments (Intensive) (6 q.h.)

A one-quarter course covering the same material found in Investments I and II. *Prereq. 44.311.*

45.304 Management and Organization (Intensive) (6 q.h.)

This course combines Management and Organization I and Principles and Practices of Management into a single course offered twice a week for a single quarter. Please refer to the course descriptions for details.

45.312 Management Decisions and Policies (Intensive) (6 q.h.)

Please refer to the course description for Management Decisions and Policies, I and II. The contents of the intensive course are the same except it is presented twice per week during a single quarter. *Prereq.* 100 quarter hours.

45.325 Entrepreneurship and Small Business Management (Intensive) (6 q.h.)

Same as 45.323 and 45.324. Not open to students who have taken those courses.

45.402 Production Management and Manufacturing Systems (Intensive) (6 q.h.)

Same as 45.400 and 45.401. Not open to students who have taken those courses.

45.453 Purchasing (Intensive) (6 q.h.)

Same as 45.451 and 45.452. Not open to students who have taken those courses.

47.322 Real Estate Fundamentals (Intensive) (6 q.h.)

Same as 47.320 and 47.321. Not open to students who have taken those courses.

49.303 Law (Intensive) (6 q.h.)

Introduction to the legal system; study of the nature, formation, and essential elements of contracts, including performance and remedies for breach. Analysis of the law of agency, including creation, rights, and duties of principal and agent, scope of authority, relationships to third persons, termination of agency.

Principles and problems associated with the following areas of business law:

Personal property—its nature and characteristics.

Sales—nature of sales and law of sales.

Landlord and tenant—respective rights and duties.

Commercial paper—negotiability, negotiations, checks and notes.

Bankruptcy—outline of federal bankruptcy, its application and administration.

Business organization—analysis of the corporation, partnerships and other forms of business organizations.

49.314 Electronic Data Processing (Intensive) (6 q.h.)

Intensifies material of EDP I and EDP II into a single quarter by doubling frequency of class meetings and pace of non-class work.

49.339 COBOL Programming (Intensive) (9 q.h.)

Intensifies material of 49.321, 49.322, and 49.323 into a single quarter by meeting twice a week for three hours per session. The pace of non-class work is also intensified. *Prereq.* 49.311.

49.375 Systems Analysis and Design (Intensive) (6 q.h.)

Same as 49.360 and 49.361. Not open to students who have taken those courses.

49.387 Quality Control and Management (Intensive) (6 q.h.)

Same as 49.381 and 49.383. Not open to students who have taken those courses. *Prereq.* 39.313.

49.402 Human Relations in Organizations (Intensive) (6 q.h.)

Same as 49.400 and 49.401. Not open to students who have taken those courses.

49.422 Labor Management Relations (Intensive) (6 q.h.)

Same as 49.420 and 49.421. Not open to students who have taken those courses.

Prereq. 39.303.

50—EDUCATION FOUNDATIONS

50.114 Education and Social Service (4 q.h.)

Introduction to the social scientific analysis of education and a brief exposure to methods and thinking of these social sciences. The student should develop an orientation to and awareness of the complexity of the educational scene in America and the world today.

50.131 Human Development and Learning II (4 q.h.)

Continuation of Human Development and Learning I. Significant aspects of adolescence—physical, social, and psychological factors as they influence adolescent behavior.

50.132 Creative Expression in Children (4 q.h.)

This course is designed to explore and release the creativity of students who intend to work with children in a variety of settings; examine the potential of creative expression for interpersonal communication; relate children's creative experiences to their cognitive, emotional, and social development; and assist students to acquire experience and confidence in working with various media available for creative expression. *Prereq.* 50.121.

50.133 Educational Applications of Social Psychology (4 q.h.)

Focus on theory and research in social psychology especially relevant to education. Areas covered are prejudice in the classroom; the school as a setting for manifestation of authoritarian personality; attitude organization and change in an educational environment; the class and the clique as "small groups", the expression of need for achievement in various school structures and related topics. *Prereq.* 50.121 or 50.131.

50.134 Mental Health in Teaching (4 q.h.)

Factors involved in the choice of teaching as a career, and of psychological and occupational factors which contribute to teacher happiness and dissatisfaction, adjustment, and maladjustment. Examination of these factors as a background against which to consider: what teachers can do to foster healthy personalities; how to deal with psychological forces in the classroom; steps to strengthen the emotional development of the normal child. *Prereq.* 50.121 or 50.131.

50.135 Cross-Cultural Studies of Child Rearing and Education (4 q.h.)

Patterns of socialization in contrasting cultures and possible and/or demonstrated resultants in areas of personal development of concern to educators. Readings are mainly ethnographic studies of child rearing and psychological investigations of children from contrasting backgrounds. *Prereq.* 50.121 or 50.131.

50.136 Language and Cognition: Educational Implications (4 q.h.)

Development of language and thought in the child: concept learning, problem solving, and language acquisition. Particular consideration given to the implications of current research and theory of these areas for educational practice. *Prereq.* 50.121 or 50.131.

50.137 Seminar in Adolescent Psychology (4 q.h.)

An in-depth examination of the motivational, intellectual, social, and emotional development of adolescents from the end of pre-adolescence to the beginning of young adulthood. Emphasis is also on current issues such as drug use, sexual behavior, and vocational problems. *Prereq. 50.131.*

50.138 Seminar in Human Learning and Motivation (4 q.h.)

Survey and analysis of the literature on human learning and motivation. Emphasis on interaction between human learning and motivation in the developmental process and in the classroom. *Prereq. 50.121 or 50.131.*

50.139 Seminar in Early Childhood Development (4 q.h.)

The theory and research regarding the cognitive, personality, and social development of children from birth to six years, with respect to their implications for early childhood education. Various existing programs examined and new directions explored. *Prereq. 50.121.*

50.141 Measurement and Evaluation (4 q.h.)

The fundamentals of measurement; the use of basic statistical concepts and techniques; evaluation of standardized and teacher-made tests. *Prereq. 51.135.*

50.152 Comparative Education (4 q.h.)

Education in other nations. Relationships with the political, economic, social, and cultural milieu in Western and Eastern Europe, the Near and Far East.

50.153 Philosophy of Education (4 q.h.)

Objective is to help participants examine their own purposes in relation to those of the school as an institution. Philosophical writings (on topics such as the ethics of educational intervention, the delineation of educational concepts, the educational messages of long-range speculations and utopias, and normative assumptions underlying educational policies) and the practice of education in the class are the main materials. Dialogue is the main method.

50.154 Current Issues in American Education (4 q.h.)

An analysis of the variety of educational issues confronting elementary and secondary teachers. Attempts to place issues in a historical context and to expose students to a variety of educational programs in the Boston area that are palpable efforts to deal with the issues.

50.161 Seminar in Group Process (4 q.h.)

A study of the structure, dynamics, and function of face-to-face groups leading to learning about goal achievement and task orientation. The course operates mainly by committee of group instrumentation. Examines the function of informal relationships within groups, peer relationships, superior-subordinate relationships, authority and intimacy, and the inclusion and exclusion processes. Also involved is the aspect of self-understanding.

50.163 Schools as Social Systems (4 q.h.)

An analysis of schools as sociocultural subsystems within the larger society. Functional interrelationship between student and school subcultures, status and role systems; and authority structures in American schools. *Prereq. 50.114 or equiv.*

50.164 Class and Ethnic Relations in Education (4 q.h.)

The various ways in which the American class system and patterns of ethnic group relations have affected, and have been affected by American education. The limitations and potential of educational institutions with respect to the resolution of inter-group conflicts and the establishment of equal educational opportunities. *Prereq. 50.114 or equiv.*

50.165 Organization and Politics of School Systems (4 q.h.)

The political sociology of school systems in the U.S. An analysis of the power and authority structures in contemporary education. Who controls the system? How are the various interest groups organized? What are the mechanisms for conflict resolution? The relationship between professional and nonprofessional interest groups. *Prereq. 50.114 or equiv.*

50.166 The Human Services Professions (4 q.h.)

This course explores what a human services agency is, how it comes into being, and how it grows and changes. Basic attitudes, values, skills, and knowledge of the human services worker are analyzed, as are the reasons why people in modern society require the assistance of human services professionals. Human services are viewed from the eyes of clients as well as society as a whole. Field work in a variety of public and private agencies is a major component of the course, as is a good deal of independent activity. *Prereq. 50.114 or equiv.*

50.167 Education and Psychosocial Development (4 q.h.)

Theories and research on the socialization functions of education. The relative influence of early vs. post-childhood socialization; professional and adult socialization; the role of diverse educational experiences and institutions in personality development and change. *Prereq. 50.114 or equiv.*

50.168 Education and Social Change (4 q.h.)

A sociological exploration of educational systems as independent and dependent variables in social change. Instances of planned educational change in various countries and their implications for contemporary American society. *Prereq. 50.114 or equiv.*

51—EDUCATION-CURRICULUM AND INSTRUCTION

51.126 Teaching Reading in Secondary Schools (4 q.h.)

For English and social studies majors in the College of Education who are preparing for teaching in the junior or senior high schools. Basically the same approach and organization applies to this course as to the elementary level course.

51.135 Analysis of Teaching and Educational Process (4 q.h.)

The relationships that exist between instructional objectives and teaching behavior; applications of human development and learning concepts as they relate to subsequent specialized teaching methods and materials. Research results and promising theory are used to extend the prospective teacher's concepts of the teaching functions. *Prereq. 50.131.*

51.143 Methods and Materials of Teaching English (4 q.h.)

An introduction to the structure and functions of language as they apply to the

teaching of English; curriculum and planning in English; the unit approach; specific techniques of teaching reading and literature, grammar and usage, written and oral composition, listening, spelling, vocabulary, and the use of mass media. *Prereq.* 51.135.

51.151 Student Teaching and Seminar (8 q.h.)

Full-time participation in a University-arranged and supervised school program designed to provide opportunity for the analysis of learning and teaching and for the demonstration, evaluation, and development of teaching skills. *Prereq.* *Formal acceptance into and completion of Advanced Professional sequence with minimum 2.0 Q.P.A., both overall and in teaching major.*

62—BOSTON-BOUVÉ

62.410 Cardiovascular Health and Exercise (1 cl., 3 lab, 3 q.h.)

A comprehensive cardiovascular medical and physical fitness evaluation including a resting 12 lead electrocardiogram, an exercise electrocardiogram, resting and exercise blood pressure, an aerobic work capacity evaluation, a pulmonary function test, blood lipid profile, cardiovascular medical examination, coronary risk factor profile and medical history, test of body composition, and tests of muscular strength, endurance, and flexibility. Individual exercise programs will be prescribed based on test results and included in a structured exercise and jogging class three days per week. A weekly cardiovascular health and exercise lecture will be conducted.

63—THERAPEUTIC RECREATION SERVICES

63.301 Principles and Practices of Therapeutic Recreation I (3 q.h.)

Overview of the field, including rationale, history, philosophy, goals, treatment settings, problems of institutionalization, sexual role demands, loss of human dignity, adjunctive therapies, and professional development in therapeutic recreation. Course will conclude with introduction of case method. *Prereq.* 30.304 or 30.305 (or taken concurrently).

63.302 Principles and Practices of Therapeutic Recreation II (3 q.h.)

Basic medical terminology and in-depth orientation to sensory, neurological, orthopedic and cardiovascular disabilities, prosthetics, and orthotics. A study of attitudinal and societal barriers to the handicapped. *Prereq.* 63.301 or equiv.

63.303 Principles and Practice of Therapeutic Recreation III (3 q.h.)

Integrated case method approach to understanding the diversified needs of the person who is handicapped. Psychological, sociological, and emotional impact of disabilities. Designing of individual and group activity. Planning, charting, adapting, and evaluating programs. *Prereq.* 63.302 or equiv.

63.304 Group Dynamics and Leadership I (3 q.h.)

Self-awareness, identity, interpersonal and intergroup communications. The group process: factors influencing the need to join the group, motivation to participate, membership screening, size, purpose, behavior patterns, developing rapport, open-ended and closed approaches, group problem-solving, brainstorming, conflict resolution.

63.305 Group Dynamics and Leadership II (3 q.h.)

The how and why of group dynamics in a therapeutic recreation setting. Organization, development, and structure of groups, team building, role and value clarification, ramifications of change, characteristics and styles of leadership. *Prereq.* 63.304 *or equiv.*

63.306 Group Dynamics and Leadership (Intensive) (6 q.h.)

Equivalent to 63.304 and 63.305.

63.310 Field Practicum I (4 q.h.)

Assigned field experience in a treatment facility under supervision of a qualified professional. Student has the opportunity to learn the total job operation averaging six hours a week for ten weeks, in conjunction with written reports, evaluation, and seminars. *Prereq.* 63.303, *plus 12 q.h. of professional courses and permission of consultant.*

63.311 Field Practicum II (4 q.h.)

Continuation of 63.310 *Prereq.* 63.310.

63.315 Independent Study (4 q.h.)

Empirical research project geared to the individual's area of professional focus. The student is expected to gather, analyze, and evaluate original data and periodically submit progress reports to research adviser. *Prereq.* 63.303 *plus permission of consultant.*

63.316 Independent Study (4 q.h.)

Continuation of 63.315. *Prereq.* 63.315 *or* 63.592

63.321 Social Recreation (3 q.h.)

Planning and motivation for social recreation activities; ice breakers, mixers, active and inactive games, adapting and creating joint projects, special events.

63.322 Music Therapy (3 q.h.)

An introduction to the field of music therapy including an exploration of the historical and current theories and various contemporary techniques and their uses in various clinical settings. The course will include a survey of the literature of therapy with special education, psychiatric, and geriatric areas.

63.323 Arts and Crafts I (3 q.h.)

Overview of the creative media available for individual projects. Development of the technical capability to utilize a wide variety of materials in imaginative ways. Compilation of personal arts and crafts manual as reference tool.

63.324 Arts and Crafts II (3 q.h.)

Adaptation of creative skills to a therapeutic setting. Developing flexibility and sensitivity to the client's personal needs and interests so that innovative craft projects are designed to meet needs and to maximize their therapeutic benefits. *Prereq.* 63.323 *or equiv.*

63.325 Arts and Crafts (Intensive) (6 q.h.)

The equivalent of 63.323 and 63.324.

63.326 Media Resources and Techniques (3 q.h.)

Designing overlays, transparencies, posters, brochures, and other materials. Use of slides and tapes. Learning the operation of P.A. systems, the 16 mm, opaque film strips and overhead projectors, and other photographic devices.

63.327 Therapeutic Use of Dramatics (3 q.h.)

Reinforcement and socialization through pantomime, improvisations, puppetry, skits and stunts, dramatic games, storytelling, one-act plays with emphasis on creativity in the therapeutic setting.

63.330 The Process of Aging (3 q.h.)

The psycho-social dynamics of growing old, physical changes as a result of aging, needs of elderly people, attitudes toward work, retirement, and leisure. A study of dependency, remotivation, death and dying, as well as programs and services which add quality to the long life.

63.331 The Nursing Home Experience (3 q.h.)

Exchange of empirical data relating to case experiences and institutional procedures encountered by activity leaders and other practitioners in nursing homes. Feasibility of functional innovations will be discussed in relation to present practices.

63.332 Therapeutic Recreation in Rehabilitation (3 q.h.)

Philosophy, goals, and background in rehabilitation and team membership concepts. The role of therapeutic recreation in the acute and chronic hospital, the rehabilitation center, and various community settings.

63.333 Therapeutic Recreation in Corrections (3 q.h.)

A study of penal institutions, their goals, practices, and the inmate population. The actual and potential role of therapeutic recreation in various correctional settings.

63.334 Camping for Severely Disabled Children (3 q.h.)

Basic goals, processes, and considerations of camping for this special population. Emphasis on social integration with non-handicapped children. If conducted in the summer session, most classes will be held at the Warren Center in Ashland for more contact with the campers and Warren program which is jointly sponsored by the Easter Seal Society of Massachusetts and the Recreation Education Department of Boston Bouve College.

63.335 Activity and Movement Analysis (3 q.h.)

Basic anatomy as it relates to the identification of muscle groups involved in action. Analysis of both the movement and the ingredients of the activity and their suitability with given disabilities.

63.336 Mental Illness and Retardation (3 q.h.)

The cause, effects of mental illness and retardation through exploration of individual life experiences. Curriculum includes exploration of family and community resources available to the mentally ill and retarded.

63.337 Therapeutic Recreation in Child Development (3 q.h.)

Growth and development patterns, diagnosing early childhood abnormalities; study of the need for play, learning through play, therapeutic values of play, social ethics, safety considerations, and others.

63.340 Leisure Counseling (3 q.h.)

Remedial and developmental process designed to produce behavioral and attitudinal changes in the leisure use patterns of the client. Development of competence in identification, utilization, and referral to appropriate recreational resources. Awareness of cross-cultural recreation patterns. Leisure counseling fundamentals compared in a variety of recreational settings. *Prereq.* 63.303 or one year professional experience.

63.341 Humanistic Approaches to Recreational: Noncompetitive and Intergenerational (3 q.h.) (formerly "Eclectic Approaches to Client Treatment")

This course will provide students with a concrete understanding of the use of trust, imagination, verbal/non verbal communication, and creative thinking in working with children, senior citizens, and adults of all ages. Designed to increase the student's personal growth, a large variety of behavioral methods will be explored, including: remotivation and reality therapy, the creative arts, intergenerational programming, the group process, motor coordination, sensory awareness, and success-oriented/self-responsibility program development.

86 & 87—HEALTH PROFESSIONS PROGRAMS

Courses open to all Health Professions students.

86.300 Medical Terminology Survey (3 q.h.)

An introductory survey to Medical Terminology. Not open to medical record students. *Prereq.* Courses in Anatomy and Physiology.

86.301 Medical Terminology I (2 q.h.)

An intensive introduction to medical terminology including stems, prefixes, and suffixes. Practice in usage. *Prereq.* Courses in Anatomy and Physiology.

86.302 Medical Terminology II (2 q.h.)

A more extensive and in-depth consideration of medical terminology. Intended for the medical records specialist. *Prereq.* 86.301.

86.303 Foundations of Medical Science I (3 q.h.)

Study of major disease problems in our society and modes of treatment. Intended for the non-medical student who wishes an understanding of problems faced by the physician in daily practice, to facilitate communication between medical and non-medical members of the health team. Discusses organized care diagnosis, and treatment. Topical emphasis on reproduction, birth, and pediatrics. *Prereq.* Course in Anatomy and Physiology.

86.304 Foundations of Medical Science II (3 q.h.)

A continuation of 86.303, emphasizing dental health, dermatology, heart disease, cancer, stroke, blood and lymphatic diseases, accidents, musculo-skeletal, respiratory, and gastro-intestinal diseases. *Prereq.* 86.303.

86.305 Health Science Statistics (3 q.h.)

A course designed to give the opportunity to the health practitioner to learn the application of basic statistical techniques to be utilized in gathering, displaying, and

interpreting health data. The principles of research design are considered. Agencies involved in collecting statistical data will be reviewed. *Prereq.* Basic Statistical course or permission of instructor.

86.306 Hospital Law and Ethics (formerly 86.502) (3 q.h.)

A study of important legal principles and rulings of importance to medical administrative personnel and others. Brief introduction to interpersonal ethics in patient care.

86.307 Hospital Organization and Management I (formerly 86.581) (3 q.h.)

Examination and use of general management concepts in a health care context. Case method used to explore marketing, human behavior in organizations, managerial economics, production and operations management, environmental analyses, and policy problems of professional service organizations.

86.308 Hospital Organization and Management II (formerly 86.582) (3 q.h.)

Continuation of first quarter with emphasis on organizational issues and developmental use of long range planning framework which ties previous areas together. Case method utilized. *Prereq.* 86.307.

86.310, 86.311 Applied Health Care Management I, II (formerly 87.509, 87.510, 87.511) (6 q.h.)

Practical application of management principles in health care agencies.

86.312 Communications for Health Care Personnel I (formerly 86.601) (3 q.h.)

A two-part course blending the demands of careful interviewing techniques, thorough record keeping, and accurate and articulate health correspondence. Emphasis placed on effective interaction between patients and health personnel, and between health workers and staff members of health agencies. Deals with the means of effecting good communicative skills with community resources for the benefit of patients.

86.313 Communications for Health Care Personnel II (formerly 86.602) (3 q.h.)

Continuation of 86.312. *Prereq.* 86.312 or permission of instructor.

86.320 Principles and Practices of Community Health I (3 q.h.)

An overview of specialized health care facilities and their impact on health care delivery, including special focus on ambulatory care, neighborhood health centers, HMO's and other developing modalities.

86.321 Principles and Practices of Community Health II (3 q.h.)

Continuation of 86.320 with emphasis on innovative approaches to meeting and responding to community health needs. *Prereq.* 86.320.

86.322 Principles and Practices of Community Mental Health (formerly 86.516) (3 q.h.)

An introduction to the basic principles and techniques of modern mental health practice.

86.323 Public Health I (formerly 86.521) (3 q.h.)

Principles of public health. Organization of health agencies and services.

86.324 Public Health II (formerly 86.522) (3 q.h.)

Continuation of 86.323, emphasizing community organization for health services.

86.325 Health Care Delivery (3 q.h.)

A survey course dealing with current and future problems in health delivery.

86.326, 86.327 Contemporary and Controversial Health Care Issues I, II (formerly 86.545, 86.546) (6 q.h.)

A survey of contemporary health topics. Timely issues are analyzed to differentiate fact and opinion. The course is designed for non-medical individuals desiring authentic information on current health matters. General and mental health topics will be covered.

86.328 Home Health Care (formerly 86.515) (3 q.h.)

A course designed to cover all aspects of providing effective community home health care, and the impact of these programs on the health care delivery system.

86.329 Environmental Problems & Health (formerly 86.531) (3 q.h.)

A survey of environmental conditions in land, air, and water. The causes of pollution; effects of man and other life; and a general discussion of current control methods. Particular emphasis on the significance of environmental problems to the individual.

86.330 Health Science Education I (3 q.h.)

Introduction to program planning and the development of educational objectives with special focus on the use and process of evaluating objectives. Presentation of teaching strategies for the professional practitioner.

86.331 Health Science Education II (3 q.h.)

Continuation of 86.330 with emphasis on the use of the media and the design of learning packages in health education. *Prereq.* 86.330.

86.332 Methods and Materials in Public Health Education (formerly 86.524) (3 q.h.)

An introduction to health education in the public health context. *Prereq.* *Public Health course or permission of instructor.*

86.333 Medical Care and Current Social Problems I (3 q.h.)

Seminar course discussing society's organization to deliver medical care services. *Prereq.* 86.327 or *equiv.*

86.334 Medical Care and Current Social Problems II (3 q.h.)

A continuation of 86.333 discussing topics identified in the first part of the course as matters of great concern in the field of medical care. *Prereq.* 86.333.

86.337 Oral Microbiology (formerly 86.535 and 86.536) (3 q.h.)

The qualitative and quantitative composition of the microbiota inhabiting the various ecologic niches of the oral cavity. Methods which have been used to study the oral microbiota are critically evaluated. Ecologic factors such as adhesion, growth factors, and physico-chemical environment controlling the establishment of colonization of organisms in such sites are discussed in detail. The pathogenic potential of plaque microorganisms in terms of caries, periodontal disease, and mixed anaerobic infections will be evaluated. *Prereq.* *Chemistry, Microbiology I.*

86.338 Advanced Periodontology I (formerly 86.537) (3 q.h.)

The structure of the periodontal tissues at both a light and electron microscope level will be discussed. Particular attention is paid to the vascular and cellular changes in inflammation. Consideration of the physiological and chemical basis of the observed differences in pathological and nonpathological processes is examined extensively with emphasis on the dynamics of these changes. *Prereq. Anatomy and Physiology, Chemistry, Pathology.*

86.339 Advanced Periodontology II (3 q.h.)

The etiologic factors responsible for the pathologic alterations discussed in part one will be examined. Attempts to correlate experimental animal findings with the human clinical situation. Methods of diagnosis, treatment planning, and treatment, as well as approaches to the evaluation of therapeutic efficacy are discussed. Stress is placed on relating modern concepts of etiology to alterations in approach to therapy. *Pre-req. 86.338.*

86.340 Long Term Care Administration I (formerly 86.571) (3 q.h.)

The organization of care for the long-term acute and chronically ill patient. Goals and purposes of types of long term care facilities. Budgeting, financing, administration and services.

86.341 Long Term Care Administration II (formerly 86.572) (3 q.h.)

Nursing units; role of the physician. Nursing home-hospital relationships. Therapies. Social Work. *Prereq. 86.340 or equiv.*

86.342 Long Term Care Administration III (formerly 86.573) (3 q.h.)

Design of long-term care facilities, capital funding, staffing, budgeting, public relations. *Prereq. 86.341 or equiv.*

86.343 Long Term Care Administration IV (formerly 86.577) (3 q.h.)

The nature and problems of aging; individual and social considerations. *Prereq. 86.342 or equiv.*

86.344 Long Term Care Administration V (formerly 86.578) (3 q.h.)

The care of elderly patients in home, community, and institutions. *Prereq. 86.343 or equiv.*

86.345 Long Term Care Administration VI (formerly 86.579) (3 q.h.)

Seminar course on the provision and improvement of services to the elderly. *Prereq. 86.578 or equiv.*

86.346 Advanced Health Care Nutrition (3 q.h.)

Food chemistry, nutrition and physiology as applied to diet. Recent developments in normal nutrition. A critical review of the literature with emphasis on the experimental data on which the principles of human nutrition are based. Emphasis on the concept for people of all ages. *Prereq. Basic Nutrition course.*

86.347 Advanced Pharmacology (3 q.h.)

This course deals with drugs, their sources, appearance, chemistry, actions and use. *Prereq. Basic pharmacology course.*

86.348 Health Care Financing I (3 q.h.)

Introduction to health care accounting, control and finance, including third party reimbursement of hospitals. *Prereq.* 41.302.

86.349 Health Care Financing II (3 q.h.)

Continuation of first quarter course including a four-step process for control (planning, programming, budgeting, and control) and financial issues (capital budgeting, cash budgeting) and other financial analyses.

The following courses are offered by Liberal Arts and Business Administration and are available to health profession students:

39.341 Medical Economics (3 q.h.)

Examination and discussion of the following topics: health care trends in the United States; causes of increases in medical care costs; supply and training of health care personnel; the nation's need for physicians, nurses, pharmacists and other allied health personnel; the quality of medical care; economics of health insurance plans; consumer demand for health care, medical facilities, professional personnel and semi-professional personnel.

49.373 Information Processing in Medicine (formerly 45.697) (3 q.h.)

A non-technical survey of the importance and potential of computers in medicine: medical records; clinical reporting systems; automated laboratories; on-line monitoring; research needs; medical administration requirements. Analysis of the content and interactions of medical information sub-systems. Implications of computerization of various medical activities; equipment selection; organizational considerations. (Offered odd-dated years) (Available in Boston only) *Prereq.* 49.310 or 49.314.

*Courses open to Medical Record Students Only***86.370 Medical Record Science I (formerly 86.554) (6 q.h.)**

Introduction to medical records; history of the medical record, and medical record forms. A study of the professional medical record administrator and his/her relationship to the health facility. A study of the numbering, filing, and security of medical records. Quantitative analysis of the record is stressed; didactic and laboratory experiences incorporated. *Prereq.* 80 q.h. of credit including 18.324, 18.325, 86.301, 86.302.

86.371 Medical Record Science II (formerly 86.555) (6 q.h.)

Principles of law as related to patient care and medical records. Rules of privileged communication and the release of information to agencies are stressed. Medical staff and committees are covered. Accreditation regulations are considered; didactic and laboratory experiences incorporated. *Prereq.* 86.350 or 86.554.

86.372 Medical Record Science III (formerly 86.556) (6 q.h.)

Study of the basic principle for compiling statistics for hospital and health facilities. Preparation of reports and vital statistic reporting are taught. Classification theory and the principles of disease coding are covered. Special indexes are reviewed; didactic and laboratory experience incorporated. *Prereq.* 86.351 or 86.555.

86.353 Organization of the Medical Record Department I (3 q.h.)

The study of the hospital, patterns of organization, lines of responsibility and authority, medical staff and administrative organization, departmental functions, and organization. The planning aspects of management and the study of fundamental principles and successful practices in getting office work accomplished are stressed. *Prereq.* 86.352 or 86.556.

86.354 Organization of the Medical Record Department II (3 q.h.)

Office management problems and their solution, conceptive framework for the operation of essential management function, facilities, solutions, and contributions to the office. The study of the controlling function in the Medical Record Department. Quality control, time standards, cash controlling, budgeting and office manuals. Work simplification and systems as it applies to the Medical Record Department.

86.373 Medical Record Science IV (formerly 86.557) (6 q.h.)

Specialized record systems are covered. Topics include: long-term care, home care, ambulatory care, and psychiatric data handling; didactic and laboratory experiences incorporated. *Prereq.* 86.352 and 86.304.

86.374 Medical Record Science V (formerly 86.558) (6 q.h.)

A study of health care legislation, quality assurance, utilization review, PSRO's, planning agencies and their impact on record management; didactic and laboratory experiences incorporated. *Prereq.* 86.355 or 86.557.

86.357 Current Issues in Medical Record Administration (formerly 86.559) (3 q.h.)

Seminar course discussing new problems presented by changing patterns of medical care. Review of the current literature.

86.358 Medical Record Computer Science (formerly 86.585) (3 q.h.)

Electronic data processing applications in the medical record environment. The study of the hospital information system. Application of computers in hospital methodology and assessing the need for EDP in medical record environment. Trends in the state of the art and future prospects for medical record management. *Prereq.* EDP I, 86.374.

86.375 Applied Medical Record Science I (2 q.h.)

Clinical practice in medical record science and management techniques at one or more of the affiliated hospitals.

86.360 Applied Medical Record Science II (formerly 86.587) (3 q.h.)

Clinical practice in medical record science and management techniques at one or more of the affiliated hospitals and health facilities.

86.376 Applied Medical Record Science III (formerly 86.588) (3 q.h.)

Clinical practice in medical record science and management techniques at one or more of the affiliated hospitals.

86.362 Hospital Management for Medical Record Administrators (3 q.h.)

An introduction to the basic management principles designed so that the health care facility will be the major source of example and case study (for Medical Record students only).

86.363 Special Topics in the Health Professions I (3 q.h.)

Independent study course to enable the student in health science, health management and medical records to focus on areas of special relevance to his/her professional goals. Materials will be developed with the aid of a faculty adviser to reflect the student's special background and needs. Arrangements should be made with the faculty adviser prior to registration for the course. Not open to Medical Laboratory Science students.

86.364 Special Topics in the Health Professions II (3 q.h.)

A continuation of 86.363. Not open to Medical Laboratory Science students.

86.365 Special Topics in the Health Professions III (3 q.h.)

A continuation of 86.364. Not open to Medical Laboratory Science students.

86.366 Special Topics in Health Professions IV (3 q.h.)

A continuation of 86.365. Not open to Medical Laboratory Science students.

Courses open to Radiologic Technology students only

86.420 Radiologic Technology Orientation I (3 cl., 3 q.h.)

A study of the history of x-radiation, radiology department organization, medical terminology, patient care and nursing procedures, and contrast media.

86.421 Radiologic Technology Orientation II (3 cl., 3 q.h.)

A study of in-depth nursing procedures relative to radiology; medical and surgical diseases; equipment maintenance and testing. *Prereq.* 86.620.

86.424 Principles of Radiology I (4 cl., 4 q.h.)

A study of practical, basic radiation protection; film processing and principles of positioning patient for radiographic studies.

86.425 Principles of Radiology II (4 cl., 4 q.h.)

A continued study of the body positioning for detailed radiograph examination. A study of the principles of precise body positioning for detailed radiographic studies. *Prereq.* 86.424.

86.422 Radiologic Science I (4 cl., 4 q.h.)

A survey of the basic concepts of physics, units of measurement; Newton's law of motion; work; energy; atomic theory of matter; electric currents; magnetism; generators; motor production; control of high voltage and x-ray production. *Prereq.* 10.527 or equiv.

86.423 Radiologic Science II (4 cl., 4 q.h.)

Interaction of x-rays and matter, modern x-ray tubes, x-ray circuits, simulator experiments, Newton's laws of motion; fluoroscopic systems; properties of solids, liquids, and gases. Temperature and heat transfer and their application. *Prereq.* 86.422.

86.426 Radiologic Photography and Exposure I (4 cl., 4 q.h.)

A study of the basic principles of image formation; electromagnetic spectrum; circuits used in radiology; x-ray tube construction; factors controlling radiographic

quality; and contrast materials in visualizing areas and organs of the body. *Prereq.* 10.527 or *equiv.*

86.427 Radiologic Photography and Exposure II (4 cl., 4 q.h.)

A study of accessory items used to improve radiographic quality; in-depth methods of protection for patient and personnel; film critique and mathematical exposure concepts. *Prereq.* 86.426 and 86.422.

86.434 Advanced Radiologic Technology I (3 cl., 3 q.h.)

A study of special procedures involving Computerized Axial Tomography, cardiac vascular procedures, neuroradiology, lymphangiography, and other related procedures. *Prereq.* Core curriculum in Radiologic Technology or its *equiv.*

86.435 Advanced Radiologic Technology II (3 cl., 3 q.h.)

A continued study of special procedures involving mammography, thermography, xerography, and ultrasound. *Prereq.* 86.434.

86.436 Radioactive Isotopes (3 cl., 3 q.h.)

Mathematical concepts, physics, dosemetry, protection, radionuclide chemistry, radiopharmaceuticals, biochemistry, equipment, positioning, clinical applications.

86.437 Radiation Therapy (3 cl., 3 q.h.)

A study of the rationale of therapy, equipment, radiation characteristics, basic radiology, biochemistry, treatment planning, protection, and basic principles of clinical radiotherapy.

86.447, 86.448, 86.449, 86.450, 86.451 Radiology Practicum (12 q.h.)

Application of theoretical principles presented at the University by performing radiographic procedures under supervision. Assigned homework to be part of lesson plans received while at the hospital, and lectures presented at the hospital and University. A.M.A. requirement minimum 2 hrs./week.

Medical Laboratory Science courses open to all students.

87.300 Medical Laboratory Science Orientation (2 q.h.)

Scope, responsibilities, opportunities, and educational requirements for the medical laboratory science professions.

87.301 Quality Control (3 q.h.)

The development of quality control programs in each medical laboratory specialty. Applications of statistical methods to medical laboratory quality control programs.

87.302 Basic MLS Electronics and Instrumentation (formerly 87.504) (2 q.h.)

A course in electricity with coverage through introductory electronic circuits. Emphasis directed to medical laboratory instrumentation and related electrical processes of measurement.

87.303 Seminar in Medical Technology (formerly 87.540) (3 q.h.)

Current topics in medical technology. Required readings and presentations by students. Guest lecturers. *Prereq.* Permission of instructor.

87.310 Hematology (formerly 87.541) (1 cl., 3 lab., 3 q.h.)

Basic hematological techniques including discussion of the differential smear and observation of the normal morphology of human red cells, white cells, and platelets. *Prereq.* 18.412 or *equiv.* (Laboratory fee) (Not for Medical Technology or Hematology majors)

87.311 Morphologic Hematology I (formerly 87.542) (1 cl., 3 lab., 3 q.h.)

Morphologic and etiologic classification of the anemias. Related diagnostic tests will be discussed. *Prereq.* 87.310 or *equiv.* (Laboratory fee)

87.312 Morphologic Hematology II (formerly 87.543) (1 cl., 3 lab., 3 q.h.)

Studies of pathologic and physiologic deviations of the white cell series as observed in leukemias and infections. Some animal hematology is included. *Prereq.* 87.311 or *equiv.* (Laboratory fee)

87.313 Epidemiology I (formerly 87.544) (3 q.h.)

Basic concepts in epidemiology. The distribution in determinants of diseases and injuries in human populations. Descriptive and analytical epidemiology studies will be included.

87.314 Epidemiology II (formerly 87.545) (3 q.h.)

Study of the microbiological distributions in determinants of infectious diseases. Hospital epidemiology. *Prereq.* Microbiology and Epidemiology I.

Courses open to Medical Laboratory Science students only

**The following courses are offered in the evening at day college tuition rates.*

***87.101 Basic Medical Laboratory Science** (4 q.h.)

This is an introductory course in basic medical laboratory science including methods, principles, and theories and includes urinalysis and basic hematology. *Prereq.* 8 q.h. of college biology and chemistry.

***87.102 Basic Medical Laboratory Hematology** (2 q.h.)

Principles and procedures of basic coagulation and blood cell morphology. *Prereq.* 18.101.

***87.103 Basic Medical Laboratory Immunochemistry** (2 q.h.)

Basic principles in immunochemistry and related techniques with particular emphasis on those procedures used in blood banking. *Prereq.* 87.101.

***87.105 Basic Medical Laboratory Science Chemistry and Instrumentation** (4 q.h.)

Principles, procedures, and techniques of basic clinical chemistry and instrumentation. *Prereq.* 87.101 and Analytical Chemistry.

***87.211 Coagulation** (1 cl., 2 lab., 2 q.h.)

Advanced studies in coagulation factor identification and problem solving of coagulation tests. Discussion of related hematologic disorders.

***87.213 Immunochemistry** (1 cl., 2 lab., 2 q.h.)

Advanced studies in antigen-antibody detection and problem solving of immunochemical tests. Discussion of related hematologic disorders, and the medical legal aspect of blood banking.

***87.222 Histochemistry** (of hemic cells) (1 cl., 2 lab., 2 q.h.)

The histochemistry and electronmicrography of hemic cells and the use of these techniques in diagnosis of hematological disorders.

Courses open to Cytotechnology students only. A special tuition rate of \$75 per credit applies to the following cytotechnology courses.

87.508 Introduction to Cytotechnology (2 cl., 2 q.h.)

A review of cell structure, principles of microscopy, and staining techniques. Anatomy and physiology of the female reproduction system and study of the non-malignant cytology of the female genital tract. (Laboratory fee)

87.528 Cytopathology I (2 cl., 2 q.h.)

Cytopathology and clinical aspects of cervical dysplasia, carcinoma-in situ, and invasive squamous cell carcinoma. Consideration of endometrial and endo-cervical carcinoma, other genital tract cancers, and radiation effect. *Prereq.* 87.508. (Laboratory fee).

87.538 Cytopathology II (2 cl., 2 q.h.)

Benign and malignant cytology of the respiratory and gastrointestinal systems correlated with the anatomy and physiology. Considerations of clinical aspects. Special collection techniques. Emphasis on cancer of the lung and stomach. *Prereq.* 87.528.

87.558 Cytopathology III (2 cl., 2 q.h.)

Study of benign, atypical, and malignant cells exfoliated from various portions of the urinary tract, in serious effusion, cerebrospinal fluid, and breast secretions. *Prereq.* 87.538.

87.518 Applied Cytology I (at Hospital) (4 q.h.)

The microscopic evaluation and screening of benign cytological smears and smears from cervical dysplasia, carcinoma-in-situ, invasive malignant tumors of the female genital tract.

87.548 Applied Cytology II (at Hospital) (4 q.h.)

The microscopic evaluation and screening of cytological smears from the respiratory tract, gastrointestinal tract, urinary tract, and from body fluids. Continuing evaluation of cytological smears from the gynecological tract.

87.578 Applied Cytology III (At Hospital) (4 q.h.)

The microscopic evaluation and screening of cytological smears from all parts of the body. Practical experience in genetic cytology.

87.618 Applied Cytology IV (at Hospital) (2 q.h.)

The microscopic evaluation and screening of cytological smears from various body sites. Effects of radiation and of chemotherapy; diagnosis of suspicious and hormonal conditions; cytological observations in pregnancy; their clinical significance.

87.568 Cytogenetics and New Concepts (2 cl., 2 q.h.)

Clinical and cytological aspects of genetics, including genetic counseling. Special uses of cytology. Cell research techniques, cancer. Epidemiology and current con-

cepts related to cytotechnology. *Prereq.* 87.558 or permission of instructor. (Laboratory fee.)

87.598 Special Topics (2 cl., 2 q.h.)

Special projects in cytology, cytopathology, or cytotechnology investigated or reviewed and reported by student. Written and oral presentation required. *Prereq.* 87.558 or permission of instructor.

87.608 Seminar: Cytopathology—Criteria and Correlations (4 cl., 2 q.h.)

Presentation, discussion, and interpretation of benign, suspicious, and hormonal conditions. The cytological diagnostic criteria of malignant tumors from various body sites and their histopathological correlation.

90—WOMEN'S PROGRAMS

(These courses are available on an open and equal opportunity basis to all students who wish to enroll.)

90.301 Career Management I (3 q.h.)

Basic approach to competence appraisal, opportunity analysis, and job development strategies. Learning how to design personal success patterns through skill identification and clustering will be featured. Additional perspective on the methods of increasing career potential will be gained through exercises in communication and the group process.

90.302 Career Management II (3 q.h.)

Allows the student to develop the skills and strategies to reach career goals through field survey practices, case research, and creative problem solving. Skills include: data collecting, initiative, decision making, interviewing, making oral presentations, and brainstorming. *Prereq.* 90.301 or equiv.

90.303 Special Topics in Career Management (3 q.h.)

Case approach to representative problems in career development. Student will select problems and propose an action plan to be tested in the field. *Prereq.* 90.302 or equiv.

90.304 Career Management (Intensive) (6 q.h.)

The equivalent of 90.301 and 90.302.

90.305 Women's Management Dynamics I: Structural and Behavioral Fundamentals (3 q.h.)

Identification of effective management practices and the inhibiting factors that impede women from acquiring them. Validity of common behavioral assumptions will be tested, including women's fears of success, inadequate motivation, social exclusion, disinclination to take charge or withstand pressure.

90.306 Women's Management Dynamics II: Leadership and Communication (3 q.h.)

The dynamics of leadership as they relate to the successful woman manager: effective communication, dealing with criticism, motivating, disciplining, and gaining staff respect. Distinguishing supervisory from management performance standards. Role

playing to increase group effectiveness and to assist in the development of leadership and problem solving capabilities. *Prereq.* 90.306 or *equiv.*

90.307 Women's Management Dynamics III: Conflict and Change (3 q.h.)

Utilization of the technical and personal tools of management for the resolution of conflict, the securing of control, and the institution of change. Special cases dealing with the application of an individual management style to an organizational problem will be presented by each student. *Prereq.* 90.305 or *equiv.*

90.308 Women's Management (Intensive) (6 q.h.)

The equivalent of 90.305 and 90.306.

90.310 Modular Approach to the Elements of Management (3 q.h.)

Provides a knowledge base of the technical, quantitative, and specialized areas of management. Familiarizes the student with the language and operational complexities of the manager's job and raises her level of diagnostic, analytic, and integrating competence. The course is divided into four, three-week modules: Module I: Economics and Finance; Module II: Budget and Accounting; Module III: Marketing; Module IV: Information Systems.

94—LAW ENFORCEMENT

94.301 Human Rights in Corrections (3 q.h.)

Consideration of the special practices and problems in the protection of human rights in the institutional environment; legal and practical aspects.

94.302 Basic Statistics in Law Enforcement (3 q.h.)

Introduction to basic statistical information procedures and operations relating to law enforcement areas; interpretation of criminal statistics; crime rates; unrecognized crime, non-reporting; recidivists' rates; individual statistics; evaluation of records; research and data on specialized services.

94.303 Correctional Counseling (3 q.h.)

Basic concepts and principles of counseling; individual and group therapy carried on in the correctional field and institutional services; case study and projects.

94.304 Criminal Investigation and Case Preparation I (3 q.h.)

General investigation techniques; collection and preservation of evidence and information; consideration of particular crimes, including arson, sexual offenses, larceny, burglary, robbery, forgery, and homicide.

94.305 Criminal Investigation and Case Preparation II (3 q.h.)

Conduct of raids; surveillance and undercover operations; methods of preparing a case for court; specialized scientific methods; exercises involving techniques of prosecution and cross-examination. *Prereq.* 94.304.

94.306 Comparative Police Systems (3 q.h.)

A study of existing police systems in other jurisdictions; examination of the organization, administration and practices in police agencies in the United States, Europe, and the United Kingdom.

94.307 Introduction to Industrial Security (3 q.h.)

The historical, philosophical, and legal basis of security; a survey of administrative, personnel, and physical aspects of the security field.

94.308 Interviews and Interrogations I (3 q.h.)

Interviewing of victims, witnesses, informants, and complainants; demonstration, study, discussion, and practice of techniques and procedures.

94.309 Interviews and Interrogations II (3 q.h.)

Techniques for legally acceptable questioning of suspects and persons in custody; laws governing interrogation practices; demonstrations, class exercises and assigned projects. *Prereq.* 94.308.

94.311 Advanced Correctional Practices I (3 q.h.)

Diagnosis and treatment of the drug addict and the alcoholic offender at both juvenile and adult levels; a study of these and related kinds of personal self-abuse as to causation and treatment.

94.312 Advanced Correctional Practices II (3 q.h.)

Case studies of persons confined; their past and present environment and relationship; consideration of purposeful resolves or regressions. A study and evaluation of correction-psychiatric facilities for the disordered offender, including the aggressive, the assaultive, and the violent subject. *Prereq.* 94.311.

94.314 Traffic Safety and Control I (3 q.h.)

A study of the state of the art of highway safety; research; traffic accident investigation; prevention; rescue, automated system of vehicular traffic accident and moving violation data collection; analysis and utilization; speed control; speed zoning techniques; radar; vascar; laws, rules, and regulations.

94.315 Traffic Safety and Control II (3 q.h.)

An in-depth study of traffic law enforcement, techniques of selective enforcement; traffic surveys; engineering, safety education, and evaluation of current traffic programs. *Prereq.* 94.314.

94.316 The Law and Institutional Treatment (3 q.h.)

The process of law from arrest of offender through release in its relation to correctional principles and practices; functions of police, defense, prosecution, and courts; legal documents related to commitment.

94.317 Comparative Correctional Systems (3 q.h.)

A study of correctional systems and methods in selected jurisdictions; examination of the organization, administration, and practices in the United States and foreign countries.

94.318 Law Enforcement Identification and Records I (3 q.h.)

Records and systems and utilization; survey of forms, files, procedures, standards, and uniformity; concentration of theoretical and practical applications.

94.319 Law Enforcement Identification and Records II (3 q.h.)

Theories and practices in personal identification principles; survey and evaluation of present and new identification techniques; historical and legal consideration of identification and record data. *Prereq.* 94.318.

94.320 Police Public Relations (3 q.h.)

The principles of sound public relations for the entire police operation; writing, public speaking, conferences, and all news media; consideration of police image and public opinion.

94.321 Police Community Relations (3 q.h.)

A survey of the role and function of police in intergroup relations; human relations and minority groups; responsibilities of police with civil rights, civil disorders, and public protection.

94.322 Research Methods in Criminal Justice (3 q.h.)

A research project related to some specific police or correctional interest or operation, in consultation with the faculty adviser. Course meets at discretion of the instructor. Project paper required for grade.

94.323 The Patrol Function I (3 q.h.)

The planning process related to the administration of the patrol function. Consideration of theoretical and operational aspects of various patrol systems; random patrol, response force, split force, team policing, probability theory, and the relationship between patrol and crime levels.

94.324 The Patrol Function II (3 q.h.)

A continuation of 94.323, with emphasis on the goals and objectives of police patrol management models. Discussion and analysis of manpower, work load, response time, patrol communications, preventive strategies, and inputs and outputs of patrol systems evaluated in quantitative form. *Prereq.* 94.323.

94.325 Introduction to Criminalistics I (3 q.h.)

A survey of the elements of microscopy, spectroscopy, and chemistry as applied to trace evidence in criminal investigations; responsibilities of technician, investigator, and others.

94.326 Introduction to Criminalistics II (3 q.h.)

Toxicology and serology; procedures related to other physical evidence; laboratory demonstrations and practical exercises. *Prereq.* 94.325.

94.327 The American Correctional System (3 q.h.)

A critical survey of the correctional field covering probation, institutions, and parole as to historical development, program content, and current problems and needs.

94.328 Social Deviance I (3 q.h.)

A consideration of the social problems of social disorganization, mental disorders, drug addiction, alcoholism, suicide, and sexual behavior.

94.329 Social Deviance II (3 q.h.)

Continuing consideration of world's population crisis, race and ethnic relations, family disorganization, work and automation, poverty and disrepute, war and disarmament. *Prereq.* 94.328.

94.330 Treatment of Offenders I (3 q.h.)

The concept of treatment and corrections; history; classification; training, education and guidance; treatment methods; inmate society; health and social services.

94.331 Treatment of Offenders II (3 q.h.)

Therapy, psychiatric and psychological considerations, case studies, evaluation of comparable methods. *Prereq.* 94.330.

94.332 Correctional Administration I (3 q.h.)

Correctional processes and services, standards, personnel and principles of management; allocation of resources, training of staff. Study of regular and special programs, volunteers and outside contracts.

94.333 Correctional Administration II (3 q.h.)

A further study of the principles of management; sentence reduction, discharge planning and work release administration. Types of institutions; compacts; regional concepts, planning, organizing, controlling and directing corrections, budgeting. *Prereq.* 94.332.

94.335 Investigative Report Writing (3 q.h.)

Report content and writing, exercises in accurate terminology and concise reporting, interpretation and evaluation of information, practical report-writing projects.

94.336 Police Supervision (3 q.h.)

The police supervisor's role in discipline; interdepartmental relations; problem handling and personnel policies; problems in supervisory relationships; wages, grievances, morale, and safety.

94.337 Police Work with Juveniles (3 q.h.)

The role of the police in delinquency prevention with emphasis on theory, administration, control, treatment, confinement, community resources, and relationships with the public and the juvenile court.

94.338 Criminology I (3 q.h.)

An introduction to the study of crime from the perspective of classical and contemporary criminological theories. In particular, attention is given to biological, psychological, and sociological approaches to the explanation of crime.

94.339 Criminology II (3 q.h.)

A continuation of Criminology I, with emphasis on the causes of crime and the relationship between law and crime. Specific implications of prevention, rehabilitation, and treatment are considered in depth. *Prereq.* 94.338.

94.340 Delinquency Prevention (3 q.h.)

A survey of delinquent behavior, causation, and delinquency prevention programs; seminar projects for discussion of specific problems and general principles in establishing delinquency prevention services.

94.341 Probation and Parole Practices I (3 q.h.)

The probation officer; pre-sentence investigation; conditions of probation; effectiveness, administrative aspects, and prediction methods; relationship to community.

94.342 Probation and Parole Practices II (3 q.h.)

The parole officer; conditions of parole; supervision; effectiveness; administrative relationships; relationships to the community, court and law enforcement agencies;

relationships of probationer and parolee to rehabilitative, social, and family services; consideration of recidivism and aftercare. *Prereq.* 94.341.

94.343 Law Enforcement Management and Planning I (3 q.h.)

Philosophy and theories of management in law enforcement; studies of organization from the administrator's viewpoint, including control, efficiency, effectiveness, and discipline.

94.344 Law Enforcement Management and Planning II (3 q.h.)

A survey of the administrator's role, including special activities and responsibilities; administrative planning, civilian personnel, including recruitment, selection, evaluation; training; budgets; management records; interpersonal communications; auxiliary services; evaluation of present and future management systems. *Prereq.* 94.343.

94.345 Juvenile Corrections I (3 q.h.)

A study of police, detention, petition, and hearings related to juveniles; juvenile court procedures, philosophy, and terminology; adjudication.

94.346 Juvenile Corrections II (3 q.h.)

Social workers, probation officers, judges, psychologists, and psychiatrists with relation to juveniles; institutions; aftercare; prevention. *Prereq.* 94.345.

94.350 Document Control (3 q.h.)

A detailed study of procedures for handling and control of classified and other sensitive information; a survey of control systems from manual to semi-automated systems using data processing equipment.

94.351 Industrial Fire Prevention (3 q.h.)

Principles and practices of fire safety, including organization and management responsibility, property conservation, safeguards for construction, fire control apparatus and functions, engineering and scientific data on fires and related perils.

94.352 Physical Security I (3 q.h.)

The basic foundations for security in industry, banking, transportation, utilities, and other non-governing operations; physical requirements and standards.

94.353 Physical Security II (3 q.h.)

Implementation of security; study of inanimate aspects, including alarm and surveillance devices; study of animate aspects of protection. *Prereq.* 94.352.

94.354 Retail Security (3 q.h.)

The operation of security departments including functions of mercantile establishments; dishonest employees; shoplifters; management and public relations; receiving, shipping, and warehousing; special laws and procedures.

94.355 Bank Security Measures (3 q.h.)

An in-depth study of the principles and practices of security measures for banks and other financial institutions and the preparation of rules establishing minimum standards under current federal and state legislation.

94.356 Seminar in Security (3 q.h.)

An analysis of current problems in security such as growth patterns, salary structures, training and education, existing weaknesses; field trips, individual study assignments, and required oral and written reports.

94.357 Seminar in Correctional Practices (3 q.h.)

An analysis of current problems in corrections designed to meet the needs and interests of specific groups of students, practitioners, supervisors, and administrators of correctional programs.

94.358 The National Law Enforcement Seminar (3 q.h.)

An annual, concentrated exploration of current viewpoints, varied solutions, innovative procedures, and critical analyses in the issues facing law enforcement, correctional practices, and security, drawing on exceptionally qualified local and national figures. A research paper under the direction of a faculty adviser is required for credit. (Not offered every year).

94.359 Seminar in Hospital Security (3 q.h.)

The function of protection in the health industry; medical security administration, including study of health care providers; trends in hospital law; security from injury, fire and loss in the medical world; security methodology for safeguarding specialty areas; the security role in mass casualty management and emergency preparedness; the concept of professionalism; community liaison; and patient attitudes toward security.

94.360 Current Security Problems (3 q.h.)

An analysis of special problem areas such as security education and training, community relations, white-collar crime, drug abuse, theft control, shoplifting, document control, subversion and sabotage, protection of classified information, control of proprietary information and business espionage, labor problems, civil disturbances, and natural and man-made disasters.

94.361 Law Enforcement Mathematics I (3 q.h.)

A review of elementary algebra; algebraic expressions and operations, equations, word problems, and solutions to mathematical problems in their practical applications in the criminal justice field. Probability, trigonometry, statistics, ratio, and probabocation.

94.362 Law Enforcement Mathematics II (3 q.h.)

Further review; fundamental operations, measurement and computation, solutions of linear and quadratic equations. Equations of motion and energy, permutations, combinations. Application of these principles will be applied to most areas of law enforcement. *Prereq.* 94.361.

94.364 Seminar in Law Enforcement—(Youth Crime Control) (3 q.h.)

The criminality and deviance of those between the juvenile and adult age. Consideration is given to: concepts and characteristics of the youthful offender; the role of the family in youth crime; the generation gap; violence of youth hooliganism; drug addiction of youth; ordinary crimes of youth; the youth subculture and culture conflict; the role of mass media and education in youth crime; the concepts of freedom and justice in the youth culture; treatment of youthful offenders; and the state of youth crime control in foreign countries.

94.365 Seminar in Law Enforcement—(Victimology) (3 q.h.)

Criminal-victim relationship, with emphasis on victim-precipitated crimes and compensation to the victims. Consideration is given to: concept and significance of "victimology," time, space, sex, age, and occupational factors in criminal-victim relationships; victims of murder, rape, other violent crimes, and property crimes; victim-typology; the public as victim; restitution to victims of crime; compensation to victims of crime; and the functional responsibility of the victim.

94.366 Seminar in Law Enforcement—(International Crime Control) (3 q.h.)

Crimes touching upon more than one country, with emphasis on international criminal law principles, treason, and espionage. Concentration is given to: the concept of law in its comparative aspects; customs; treaties; international conventions; "comity"; culture conflicts; the "international personality"; the "attempt clause"; the Belgian approach; the Oxford approach; asylum, extradition; international ordinary criminals; political criminals; piracy (on sea and in the air); war criminals; genocide; international courts; League of Nations; United Nations; international criminal statistics; Interpol, the Soviet-type spy-schools; the history of American Intelligence.

94.367 Seminar in Law Enforcement—(Grantsmanship) (3 q.h.)

This seminar is designed to familiarize the participants with the orderly sequence of organizational steps required in providing the institutional framework necessary for preparation and submission of applications to granting agencies. Major topics include: Omnibus Crime Control and Safe Streets Act of 1968; functions of the Law Enforcement Assistance Administration; grant application strategy, planning, and research.

94.368 Seminar in Law Enforcement—(Operational Intelligence) (3 q.h.)

Designed to give the opportunity to the student to theoretically understand the value and function of an intelligence unit, including planning, directing, organizing, financing, and other salient features of the administration of these units. Emphasis is placed on organized crime, subversive activities, and liaison programs as they apply to a modern police agency.

94.369 Independent Studies (3 q.h.)

Faculty-guided research in individually selected topics relating to the criminal justice system.

94.370 Seminar in Law Enforcement—(Collective Bargaining) (3 q.h.)

The history and background of collective bargaining in the public sector as it affects members of the law enforcement field; initial establishment of rights of labor, labor legislation—federal and state; preparation for negotiation, resolutions of impasses, final agreement, and operation of the contract.

94.371 Man, Law, and Society I (3 q.h.)

A general analysis of the way in which major changes occur in the established practices of legal and social organizations and communities. Particularly concerned with the part played by legal institutions in initiating, controlling, and directing or assisting in such changes.

94.372 Man, Law, and Society II (3 q.h.)

An introduction to the social science concepts and methods in their current and potential application to social and legal problems. Aims to acquaint the student with a

variety of social research concepts and methods of special utility in investigating diverse types of social law-related problems. *Prereq.* 94.371.

94.374 Seminar in Law Enforcement—(Interviewing Practicum) (3 q.h.)

Advanced interrogation methods and procedures; techniques of persuasion; conditioning (negative and positive); the polygraph, its history and methodology; the established rules and procedures required for current diagnosis of truth and deception; the evaluation of the contemporary methods of international law enforcement agencies.

94.375 Seminar in Law Enforcement—(Organized Crime) (3 q.h.)

The nature and problems of organized crime; causes and effects; comparative and historic roots; the activities, organization, and economics; possible solutions; the scope and techniques in combating organized crime.

94.376 Seminar in Law Enforcement—(Minorities and the Urban Crisis) (3 q.h.)

An investigation of the ethnic and racial origins and characteristics of the American people; the interaction, conflicts, and possibilities of adjustment between the dominant society and minority groups, particularly in contemporary urban settings; the role and function of police in their interrelationship with minority groups.

94.377 Seminar in Law Enforcement—(Criminal Behavior) (3 q.h.)

An examination of crime and criminal behavior as a social phenomenon. Three principle divisions: sociology of law and its effect; criminal etiology and the scientific analysis of the causes of crime; evaluation of the various rationales of detention as a crime-control factor.

94.378 Seminar in Law Enforcement—(Prosecutive Development) (3 q.h.)

Lecture and discussion relating to the professional requirements of the modern police officer in the United States; oral testimony; the entire corpus delicti and all other related matters in proper form and sequence; the trial; testimony and the jury; conduct on the witness stand; opposition counsel; the defense of entrapment; opinion testimony; confessions; prospective witnesses; legal standards and the police.

94.379 Seminar in Law Enforcement—(Forensic Laboratory) (3 q.h.)

Crime laboratory organization and utilization of special equipment for the analysis, interpretation, classification, and identification of physical evidence obtained in crime scene searches. The transportation, storage, and security of physical evidence and the effect of the results, coupled with the preparation of exhibits for courtroom presentation. *Prereq.* 94.326. (Laboratory fee)

94.380 Seminar in Law Enforcement—(Intervention Strategies and Tactics for Law Enforcement Counseling Techniques) (3 q.h.)

Basic concepts and principles of intervention as a social work method. Nature of therapeutic relationships, principles of communication. Diagnostic assessment of the person-problem-situation configuration. Goal-setting process. Ego-supportive procedures and use of community resources.

94.381 Civil Liberties and the Police I (3 q.h.)

An in-depth preparation for the officer facing the practical problems of enforcing the law without breaching the civil rights of the accused and bystanders; individual

readings, lectures, group discussions, and preparations from Massachusetts and national interest cases; many incidents pertinent to the actions of the people involved with these problems will be investigated and studied; constitutional interpretation and limitations are the guidelines for the course.

94.382 Civil Liberties and the Police II (3 q.h.)

Several Supreme Court cases are followed from the time of the call, to the confrontation, arrest, examination in court, appeals, and the direct statements on the problem by jurists of the highest courts. The last section of the term ties in the latest criminal law and civil rights act changes including, but not limited to, criminal justice and no-knock laws and the latest Civil Rights Act. *Prereq.* 94.381.

94.383 Seminar in Law Enforcement—(Drugs) (3 q.h.)

Designed to acquaint the student with the needs of law enforcement personnel in the problematic area of drug abuse; the law, society classification, distribution, identification, and the effects of drugs.

94.384 Seminar in Law Enforcement—(Executive Development) (3 q.h.)

The role of the police administrator within the managerial structure. Special problems unique to the law enforcement executive, decision making, policy formation, planning, controlling, communicating, and directing. A consideration of case studies and surveys will be utilized.

94.385 Seminar in Law Enforcement—(Mental Health & the Police) (3 q.h.)

A study of the roles of law enforcement and mental health services. Diagnosis of the triggering mechanisms of behavioral disorders and the suicidal phenomenon; psychiatric and psychological considerations; case studies and the legal process.

94.386 Seminar in Law Enforcement—(Data Processing) (3 q.h.)

An introduction to automated systems utilized in the field of law enforcement; basic program concepts; filing and sorting techniques; available input and output storage media; types and sources of data communications and applications.

94.387 Administration of Justice I (3 q.h.)

A survey of the evaluation of justice from the earliest times, developed historically, with particular emphasis on Western justice and American justice, including the roles played by the judiciary, with stress on due process and the constitutional guarantees.

94.388 Administration of Justice II (3 q.h.)

An analysis of the various groups and professions in the American justice system. Emphasis is fixed on human relations, efficiency, current trends, and the future role of the American criminal justice system. *Prereq.* 94.387.

94.389 Civil Law in Criminal Justice I (3 q.h.)

Civil matters such as defamation, negligence, assault and battery, false confinement, trespass, conversion, and agency relationships.

94.390 Civil Law in Criminal Justice II (3 q.h.)

Civil matters such as the law of contracts, bailments, domestic relations and business relationships which should be known to and distinguished by law enforcement personnel. *Prereq.* 94.389.

94.391 Criminal Law I (3 q.h.)

Exploration of the major problems of criminal law as a device for controlling socially undesirable behavior. It is intended to give one a working knowledge of the basic questions of public policy involved in the administration of criminal justice and the legal principles of determining criminal liability. Course includes a consideration of specific crimes, elements of a crime, parties to a crime, and defenses to a crime.

94.392 Criminal Law II (3 q.h.)

Consideration of vital constitutional and statutory concepts, including self-incrimination, search and seizure, law of arrest, criminal procedure and responsibility, confessions, right to counsel, and conduct of trial in the District, Superior, Appellate, and Federal Courts. *Prereq.* 94.391.

94.393 Evidence and Court Procedure I (3 q.h.)

Rules of evidence; principles of exclusion; evaluation and examination of evidence and proof.

94.394 Evidence and Court Procedure II (3 q.h.)

Competency, consideration of witnesses, laws of search and seizure, court procedures, moot court exercises. *Prereq.* 94.393.

94.395 Fire Investigation and Arson I (3 q.h.)

A study of the elementary chemistry of combustion involving sources of ignition, fuels, the nature and behavior of gases and their toxicity. The combustion properties of non-solid fuels as opposed to the combustion properties of solid fuels are considered. Consideration is also given to explosions associated with fires. Discussion of the socio-economic aspects of fire including the pyromaniac and his or her physiological involvement.

94.396 Fire Investigation and Arson II (3 q.h.)

A concentrated approach is taken in dealing with the fire bug and his or her sociological orientation. A discussion of carbon, hydrogen, and oxygen as major elements in all fires and the flameless ignition effect. Methods of fireproofing are also considered and references made to various types of building materials as well as the role of pyrolysis. Fire patterns of structural fires and asphyxiation along with the legal aspects of arson are also considered. *Prereq.* 94.395.

94.397 Law Enforcement Fiscal Management (3 q.h.)

The various budgeting systems and their application to law enforcement organizations including: the line-item budget, programmed budget, performance budget, and the planned programmed budget system; development of sound fiscal policy; appropriation of funds; tax base revenue systems; distribution of public monies; budget request, expenditures; and auditing procedures.

94.398 Massachusetts Criminal Law (3 q.h.)

A comprehensive study of Massachusetts Criminal Law and its application by law enforcement officers. Areas of study include: Common law, criminal statutes, Annotated Laws, Criminal Case Law, Supreme Court Decisions, and Motor Vehicle Law.

94.399 Alcohol Problems in Law Enforcement (3 q.h.)

Acquaints student with the current state of knowledge on society, culture, and drink-

ing patterns; the variety of alcohol problems that confront peace officers; discussion of the range of solutions available.

94.400 Honors Program I (4 q.h.)

Prereq. Approval of the Dean.

94.401 Honors Program II (4 q.h.)

Prereq. 94.400.

94.402 Honors Program III (4q.h.)

Prereq. 94.401.

94.403 Security Administration I (3 q.h.)

The historical, philosophical, and legal basis of security operations. A study of various security methods, utilizing personnel, equipment, and procedures.

94.404 Security Administration II (3 q.h.)

The organization, administration, and management of the security function; the systems approach to security operations, utilizing personnel and equipment resources. *Prereq. 94.403.*

94.406 Legal Aspects of Security Operations (3 q.h.)

The study of areas of law relevant to the security professional, including related aspects of Criminal, Civil, Regulatory and Labor Law.

94.407 Introduction to Government Security Programs (3 q.h.)

An introduction to various government security programs, including the Department of Defense, Industrial Security Program (DCASR), and the Nuclear Regulatory Commission Security Standards, and an analysis of the policy and legal basis for such programs.

LAW ENFORCEMENT INTENSIVE COURSES

97.401 Criminal Law (Intensive) (6 q.h.)

Combination of 94.391 and 94.392.

97.402 Evidence and Court Procedure (Intensive) (6 q.h.)

Combination of 94.393 and 94.394.

97.403 Civil Law in Criminal Justice (Intensive) (6 q.h.)

Combination of 94.389 and 94.390.

97.404 Civil Liberties and the Police (Intensive) (6 q.h.)

Combination of 94.381 and 94.382.

97.405 Interviews and Interrogations (Intensive) (6 q.h.)

Combination of 94.308 and 94.309.

97.406 Traffic Safety and Control (Intensive) (6 q.h.)

Combination of 94.314 and 94.315.

97.407 Law Enforcement Identification and Records (Intensive) (6 q.h.)

Combination of 94.318 and 94.319.

97.408 Introduction to Criminalistics (Intensive) (6 q.h.)

Combination of 94.325 and 94.326.

97.409 Social Deviance (Intensive) (6 q.h.)

Combination of 94.328 and 94.329.

97.410 Law Enforcement Management and Planning (Intensive) (6 q.h.)

Combination of 94.343 and 94.344.

97.411 The Patrol Function (Intensive) (6 q.h.)

Combination of 94.323 and 94.324.

97.412 Criminal Investigation and Case Preparation (Intensive) (6 q.h.)

Combination of 94.304 and 94.305.

97.413 Criminology (Intensive) (6 q.h.)

Combination of 94.338 and 94.339.

97.414 Treatment of Offenders (Intensive) (6 q.h.)

Combination of 94.330 and 94.331.

97.415 Probation and Parole Practices (Intensive) (6 q.h.)

Combination of 94.341 and 94.342.

97.416 Fire Investigation and Arson (Intensive) (6 q.h.)

Combination of 94.395 and 94.396.

97.417 Advanced Correctional Practices (Intensive) (6 q.h.)

Combination of 94.311 and 94.312.

97.418 Correctional Administration (Intensive) (6 q.h.)

Combination of 94.332 and 94.333.

97.419 Law Enforcement Mathematics (Intensive) (6 q.h.)

Combination of 94.361 and 94.362.

97.421 Man, Law, and Society (Intensive) (6 q.h.)

Combination of 94.371 and 94.372.

97.422 Administration of Justice (Intensive) (6 q.h.)

Combination of 94.387 and 94.388.

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Management Sciences
Polaroid Corp.
- Francis J. Di Sabatino, M.A.*
Chemistry
Quincy High School
- Melinda M. Di Sessa, M.A.
Philosophy/Religion
- Joseph G. Diblasi, B.S.
Law Enforcement
Westwood Police Dept.
- Arthur Diette, B.S.
Law Enforcement
Lowell Police Dept.
- Edward J. Dillon, M.B.A.
Personnel Relations
Raytheon Co.
- Howard T. Dimmick, M.Ed.
Earth Science
Town of Stoneham
- Ernest S. Dinisco, J.D.
Law Enforcement
Middlesex County District
- Rosemarie M. Dittmer, M.A.
English
Graham Junior College
- Alan F. Dodd, Esq., J.D.
Political Science
Dodd & Hale
- Edward Doherty, B.S.
Law Enforcement
Boston Police Department
- Edward P. Doherty, J.D.
Law Enforcement
Town Hall
- Paul L. Doherty, LL.B.
Law Enforcement
Capitol Police

- Robert A. Dolan, M.Ed.
Law Enforcement
Research Publishing Co. Inc.
- Donna M. Dombrowski, M.A.
Medical Technology
Carney Hospital
- Michael B. Donham, M.B.A.
Personnel Relations
D.A.R.E. Inc.
- John A. Donovan, M.A.
Economics
Northeastern University
- Timothy R. Donovan, Ph.D.
English
Northeastern University
- Eugene J. Doody, M.B.A.*
Personnel Relations
Chesterton Co.
- Marcia A. Dorey, M.S.
Library Science
Northeastern University
- John S. Dowd, M.S.W.
Anthropology/Sociology
Mass. Dept. of Mental Health
- Rose A. Doyon, M.A.
English
C. Paul Dredge, M.A.
Anthropology/Sociology
Northeastern University
- Claire Driscoll, M.A.
Mathematics
Northeastern University
- John P. Driscoll, Esq., J.D.
Real Estate
Self-Employed
- Richard E. Driscoll, J.D.
Law Enforcement
Central District Court
- Robert V. Driscoll, B.S.
Law Enforcement
M.I.T. Lincoln Laboratory
- Walter T. Driscoll, Jr., M.P.A.
Law Enforcement
Scituate Police Department
- Lawrence L. Drolet, M.S.
Biology
Northeastern University
- David C. Dronsick, M.A.
Earth Science
Commonwealth of Massachusetts
- Edward L. Dube, M.B.A.*
Management
Mass. Mutual Life Ins. Co.
- Ardyn E. Dubnow, M.B.A.*
Accounting
Northrop Corp.
- Terrance J. Dugan, M.B.A.
Finance
Shawmut Bank of Boston
- Norman J. Ebsary, M.P.A.
Law Enforcement
- William T. Edgett, M.A.*
History
Northeastern University
- Ralph W. Edwards, M.S.
Health Professions
Bay State P.S.R.O.
- Robert L. Ehrmann, M.D.
Cytotechnology
Boston Hospital for Women
- James H. Elgin, M.B.A.*
Information Systems
Digital Equip. Corp.
- Sandra M. Ellingson, B.S.
Therapeutic Recreation
Home for Aged Women
- Louis J. Ennis, M.B.A.
Management
Brandeis University
- J. Clive Enos, B.S.*
Personnel Relations
Raytheon Co.
- Patricia Eskandar, B.A.
Health Professions
Beth Israel Hospital
- Herbert J. Eskowitz, M.A.
Economics
Northeastern University
- Robert W. Esmond, B.S.
Chemistry
Northeastern University
- Benedetto Fabrizi, Ph.D.
Modern Languages
Northeastern University
- Robert M. Fahey, M.Ed.
Information Systems
Northeastern University
- Sheryl L. Fairchild, B.S.
Therapeutic Recreation
Malden Hospital
- Eugene F. Fallon, M.B.A.
Finance
Genrad Inc.
- Edward J. Falvey, M.B.A.
Management
New Eng. Merchants Natl. Bank
- Andrew C. Fantasia, M.B.A.
Accounting
Charles E. Depisa & Co.
- Daniel M. Fasulo, M.P.A.
Law Enforcement
Haverhill Police Dept.
- John E. Fedeles, Esq., J.D.
Insurance
New England Life Ins.
- Irwin Feigelman, B.S.*
Accounting
U.S. Government
- Martha S. Feinberg, B.A.
Health Professions
Union Hospital
- William A. Ferson, M.A.
Economics
U. S. Dept. of Labor
- Barbara Ann P. Filo, M.A.
History
- Charles A. Findley, Ph.D.
Drama/Speech
Northeastern University
- Francis X. Finigan, M.Ed.*
Earth Science
Winchester Public Schools
- Albert J. Finney, Jr., B.S.*
Accounting
Raytheon Company
- Karen L. Fischer, M.Ed.
Art
- William H. Fisher, M.Ed.
Anthropology/Sociology
Northeastern University
- Leo J. Fitzgerald, M.B.A.
Industrial Management
General Electric
- Paul A. Fitzgerald, J.D.
Accounting
U. S. Treasury Dept.

- Paul M. Fitzgerald, B.S.
U. S. Treasury Dept.
- Kevin T. Fitzpatrick, M.B.A.*
Finance
Boston Public Library
- J. Joseph Fitzsimmons, Jr., M.B.A.
Management
Polaroid Corp.
- John M. Flaherty, Ph.D.
Metropolitan District Police
- Richard E. Flaherty, B.S.
Law Enforcement
Metropolitan District Police
- Lyn B. Fleming, M.Ed.
Health Professions
Mass. General Hospital
- David E. Floreen, M.P.A.
Political Science
- Leo M. Flynn, M.B.A.
Real Estate
Leo Flynn R.E. & Appraising
- Martin E. Foley, M.P.A.
Law Enforcement
Mass. State Police
- Robert J. Forrest, Esq., J.D.
Accounting
Briggs, Forrest, Leonardi & Gau.
- Douglas G. Foster, M.Ed.*
Earth Science
Jeremiah E. Burke High School
- Gale P. Foster, B.S.*
Marketing
Samson Ocean Systems, Inc.
- Robert M. Fox, M.B.A.
Marketing
Gerber Electronics
- Walter Foxtree, M.F.A.
Art
Boston State College
- Susan H. Francis, M.A.*
English
- Dennis N. Francoeur, B.S.
Information Systems
Honeywell
- Howard H. Freedman, M.S.*
Accounting
Raytheon Co.
- Morris Freilich, Ph.D.
Anthropology/Sociology
Northeastern University
- Melvin W. Friedman, M.B.A.*
Management
M.W. Friedman Assoc.
- Thomas L. Gaffney, A.S.
Marketing
Ingalls Associates Inc.
- W. Arthur Gagne, Jr., M.B.A.*
Management
Worcester Art Museum
- Kenneth Gagnon, B.S.
Law Enforcement
- Jerry M. Galatis, Ph.D.
Worcester Art Museum
- Esther M. Gallagher, D.D.S.
Health Professions
Tufts University
- William W. Gallagher III, B.A.
Finance
Caroon & Black
- Robert J. Galvin, J.D.
Real Estate
Lippman Miller Galvin Walker
- Mary E. Gamerman, B.A.
Biology
Northeastern University
- Rawle W. Garner, M.U.A.
Marketing/Law Enforcement
J.F.K. Federal Building
- Robert L. Garnick, B.S.
Chemistry
Northeastern University
- John M. Garvey, LL.B.
Law Enforcement
John M. Garvey
- John A. Gavin, M.A.
Law Enforcement
Retired
- Stanley S. Gawlinski, B.S.
Law Enforcement
District Attorney's Office
- Michael H. Gay, Ph.D.
Health Professions
Northeastern University
- Paul C. Gay, J.D.*
Law
Norfolk Probate Court
- Gerard J. Geant, B.A.
Real Estate
U. S. Postal Service
- Sandra E. Geer, M.A.
Psychology
Boston State College
- Victor A. Gelineau, Ph.D.
Anthropology/Sociology
Commonwealth of Mass.
- John R. Geraghty, M.B.A.
Management
I.B.M. Corp.
- Michael Gero, M.B.A.
Information Systems
Northeast Red Cross Blood Pgm.
- Burton W. Gerrig, M.Ed.
Law Enforcement
Community Health
- Emanuel M. Gilbert, B.S.
Marketing
E.M. Gilbert Assoc.
- Edwin S. Giles, Jr., B.S.*
Information Systems
Massachusetts Teachers Assoc.
- Gregory Gillis, M.A.
Biology
- Philip L. Gilman, J.D.
Law Enforcement
Minuteman Regional Vocational
Technical School District
- Mary A. Gilmore, B.A.
Political Science
Northeastern University
- Alan B. Gladstone, B.S.
Accounting
Alan Gladstone, C.P.A.
- Harvey Glass, J.D.
Personnel Relations
Stone & Webster Eng. Corp.
- Daniel D. Glatthorn, M.B.A.
Industrial Management
Boston Housing Authority
- Helen R. Glazer, B.S.
Medical Record Admin.
U. S. Public Hlth. Svc. Hosp.
- L. James Glinos, M.Ed.
Personnel Relations
Glinos Associates

- Leonard B. Goldberg, B.A.
Biology
Northeastern University
- Linda S. Goldberg, C.A.G.S.
English
- Robert L. Goldberg, M.B.A.*
Management
John Hancock Dist. Inc.
- Frederick T. Golder, Esq., J.D.
Personnel Relations
Frederick T. Golder Law Office
- Naomi Goldfield, B.A.
Anthropology/Sociology
Northeastern University
- Alan M. Goldfine, M.B.A.
Accounting
Fmr. Inv. Mgmt. Services, Inc.
- Harriet K. Goldin, M.S.
Reading
Northeastern University
- Jack B. Goldman, B.A.
Health Pessions
Ames Color File Corp.
- Stan Goldman, M.A.
Political Science
Governor's Staff Mass.
- Harold M. Goldstein, Ph.D.*
Economics
Northeastern University
- M. Alvin Goldstein, A.B.*
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General Electric
- Robert J. Goldstein, M.A.
Anthropology/Sociology
Northeastern University
- Joseph M. Golemme, M.A.
Accounting
Northeastern University
- Judith R. Goodman, M.A.
English
- Leon M. Goodman, M.B.A.*
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New England Telephone Co.
- Stephen Goodyear, M.A.*
Modern Languages
Hull Public Schools
- Bernard L. Gordon, M.S.*
Earth Science
Northeastern University
- Daniel D. Gordon, M.A.*
Economics
Salem State College
- Ralph D. Gordon, M.A.
Personnel Relations
New England Merchants Bank
- Mary Jane Gorton, M.A.
Art
Animal Aid Inc.
- Leslie C. Gosule, B.S.
Accounting
Self-Employed
- Daniel Z. Gould, M.B.A.
Industrial Management
L.F. Fales Machine Co.
- David F. Grace, M.A.*
English
Lasell Junior College
- Daniel A. Grady, M.B.A.
Accounting
W. M. Underwood
- John M. Grady, Ph.D.
Anthropology/Sociology
Northeastern University
- William E. Grady, B.S.*
Industrial Management
Courier Corporation
- George L. Graham, B.A.
Information Systems
Self-Employed
- Katherine A. Grandy, B.S.
Biology
Northeastern University
- Leon S. Graubard, M.A.
Economics
Worcester Technical
- Nancy Green, M.S.
Sociology
Northeastern University
- Richard T. Green, Ed.D.
Therapeutic Recreation
Masconomet Regional High School
- Susan S. Green, B.S.
Therapeutic Recreation
Bowdoin Nursing Home
- Herbert J. Greenwald, Ph.D.
Psychology
Bridgewater State College
- John T. Gregg, B.S.
Real Estate
Pembroke Management Inc.
- Kristo A. Gregory, M.B.A.
Finance
L. F. Rothschild, Unterberg, To
- Dennis A. Gribenas, M.B.A.
Finance
Avco Corporation
- Gerald R. Griffin, Ph.D.*
English
Northeastern University
- John L. Griffith, B.S.*
Management
State Dept. of Environmental Mgt.
- Joseph Grimaldi, M.A.
History
First National Bank of Boston
- Duane L. Grimes, Ph.D.*
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Northeastern University
- Susan R. Grolnic, B.S.
Reading
Northeastern University
- John J. Guarino, B.A.
Biology
Northeastern University
- George J. Guilbault, M.A.
Music
Johnson & Higgins of Mass. Inc.
- Ronald E. Guittarr, B.S.
Personnel Relations
Raytheon Company
- Lawrence M. Gulko, M.B.A.
Marketing
Interpretive Data Systems
- John R. Gustafson, M.B.A.
Accounting
John Hancock Life Ins. Co.
- Reginald W. Hache, M.A.*
Music
Northeastern University
- Edward A. Hacker, Ph.D.*
Philosophy/Religion
Northeastern University
- George W. Hahn, M.A.
Earth Science
Newton Public Schools

- Martin H. Halabian, J.D.*
History
Nat. Assoc. Armenian Studs. Rsch.
- John Halberstadt, M.S.
English
Northeastern University
- James F. Hall, Jr., M.S.
Chemistry
Northeastern University
- Arthur J. Halleran, M.B.A.
Real Estate
C/O Integrated Resources
- Herbert E. Halliday, B.S.
Law Enforcement
Cambridge Police Department
- Paul M. Halloran, B.S.
Information Systems
Raytheon Co.
- Donald J. Halpin, M.B.A.*
Finance
Winchester Fin. Mgt. Corp.
- Isadore Halzel, M.B.A.*
Management
Charles Stark Draper Labs.
- Jacalyn S. Hamada, B.A.
Therapeutic Recreation
Crittenton-Hastings House
- Clarence D. Hammond, Ph.D.
Psychology
Northeastern University
- William F. Hancock, Jr., M.B.A.*
Finance
Softech
- Francis R. Hankard, M.A.
Law Enforcement
Dept. of Public Safety
- Robert A. Hankin, Ph.D.
Economics
Northeastern University
- Sharon M. Hannock, B.S.
Psychology
- Norman E. Hansen, M.B.A.
Marketing
Self-Employed
- Paul H. Hansen, B.A.
Political Science
Northeastern University
- Ronald M. Hansen, M.A.
Psychology
Northeastern University
- Ilene Hantman, B.A.
Medical Record Administration
Lahey Clinic Foundation
- James J. Hardcastle III, A.B.
Transportation
The Gillette Co.
- Gerald I. Harel, Ph.D.
Economics
Mass. College of Pharmacy
- Stanley A. Harmen, Ph.D.
English
Temp. Ed.
- David J. Harrigan, M.B.A.*
Management Sciences
D.J. Harrigan Associates
- Gary C. Harris, Ph.D.
Biology
Wellesley College
- Ruth Ann J. Harris, M.A.
History
- Pamela H. Hart, M.A.*
Modern Languages
U. S. Treasury
- Thomas M. Hart, M.S.
Accounting
U. S. Treasury
- Donald R. Hayden, B.S.
Information Systems
United Carr
- David W. Hayes, Esq., LL.M.
Political Science
The Seiler Corporation
- Marie J. Hayes, M.A.
Psychology
Northeastern University
- Ruth A. Hayward, M.P.A.
Medical Record Administration
Health Records Consultant
- Robert T. Heald, M.B.A.
Accounting
Price Waterhouse & Co.
- George E. Healy, LL.B.*
Law Enforcement
Gonnincy, Gafazia and Guys Inc.
- Warren K. Heckman, M.A.*
Management
Heath Consultants Inc.
- Robert J. Hehre, D.B.A.
Finance
Northeastern University
- Barbara J. Hein, M.S.W.
Therapeutic Recreation
Mount Auburn Hospital
- Carolyn R. Henderson, M.A.
Reading
Northeastern University
- Robin M. Hendrich, M.A.
Music
Northeastern University
- William J. Hendry III, B.A.
Biology
- George S. Hennessy, M.B.A.*
Marketing
Boston Gas Co.
- Gerald H. Herman, M.A.*
History
Northeastern University
- George M. Herrick, M.B.A.
Finance
John E. Cain Co.
- Max E. Hess, M.A.
Anthropology/Sociology
Northeastern University
- George F. Hickey, Jr., M.S.
Library Science
Town of Billerica
- Robert L. Hicks, M.B.A.
Finance
Self-Employed
- Chester W. Higgins, M.B.A.*
Management
M. B. T. A.
- Peter Higgins, M.B.A.*
Accounting
Self-Employed
- William F. Higgins, B.S.
Law Enforcement
Medford Police Department
- Arthur P. Hill, M.B.A.
Marketing
Hill Assoc. Inc.
- James R. Hindman, M.B.A.
Personnel Relations
Northrop Corp.

- David W. Hmielowski, B.S.
Therapeutic Recreation
Mary Lane Hospital
- Christine L. Hobart, D.B.A.
Personnel Relations
Northeastern University
- James E. Hogan, M.B.A.
Finance
New England Merchants Bank
- Gail F. Holbrook, M.A.
Drama/Speech
Northeastern University
- Wheaton A. Holden, Ph.D.*
Art
Northeastern University
- William J. Holden, M.A.
Marketing
Bay State Abrasives
- Katherine M. Hollister, B.S.
Biology
Northeastern University
- Susan W. C. Holton, M.A.
Anthropology/Sociology
Tufts University
- Juli S. Hong, B.S.
Chemistry
Northeastern University
- James A. Hope, M.B.A.*
Information Systems
Stone Marketing Corp.
- Stephen L. Hopkins, B.S.
Biology
Northeastern University
- Daniel J. Horgan, Jr., J.D.*
Law
Self-Employed
- Leo Horowitz, B.S.
Finance
Self-Employed
- Francis A. Howard, J.D.
Law Enforcement
Retired
- Jane A. Howe, B.S.
Anthropology/Sociology
- Jeffrey C. Howry, Ph.D.
Anthropology/Sociology
Environmental Resch. & Tech.
- Anthony H. Hull, Ph.D.
History
- Doris A. Hunter, Ph.D.
Philosophy/Religion
- Robert A. Hunter, M.A.*
English
Mansfield High School
- Daniel F. Hurley, J.D.*
Personnel Relations
Self-Employed
- Thomas G. Hurley, M.A.
English
- Joseph J. Hurwitz, Ph.D.*
English
Northeastern University
- William F. Hutchins, M.Ed.
Information Systems
Wang Laboratories, Inc.
- Jack F. Ingalls, M.S. (Military Science)
Law Enforcement
Casualty Life & Surety Cos.
- John J. Irwin, Jr., J.D.
Law Enforcement
Judge, Mass. Superior Court.
- Arthur L. Isberg, LL.B.
Law Enforcement
Dept. of Correction
- Mervyn Israel, Ph.D.*
Chemistry
Sidney Farber Cancer Institute
- Herbert Itzkowitz, M.B.A.
Accounting
Rosenthal Forman Itzkowitz
- Bynum M. Jackson, Ph.D.
Medical Technology
Northeastern University
- Carol A. Jackson, M.A.
Political Science
Northeastern University
- Phillip S. Jackson, Esq., LL.B.*
Law
Self-Employed
- Joshua R. Jacobson, M.A.
Music
Northeastern University
- John W. Jagel
Art
- Thomas E. Jaillet, M.A.
Law Enforcement
Sandwich High School
- John J. Jamison, B.S.M.E.*
Information Systems
Honeywell
- Paul A. Janell, Ph.D.
Accounting
Northeastern University
- Chester A. Janiak, M.S.
Political Science
Northeastern University
- Deanna P. Jantzen, M.P.A.
Political Science
Northeastern University
- Carson C. Johnson, Jr., Ph.D.*
Psychology
Emmanuel College
- Davis M. Johnson, B.A.
Therapeutic Recreation
McLean Hospital
- Donald R. Johnson, M.B.A.
Personnel Relations
N.E. Telephone Co.
- Edward A. Johnson, Jr., M.B.A.*
Transportation
Tramco
- John W. Johnson, M.B.A.
Personnel Relations
I.B.M. Corp.
- Karen S. Johnson, M.A.
Anthropology/Sociology
Harvard University
- Robert F. Johnson, J.D.
Law Enforcement
First Security Service Corp.
- Robert P. Jolie, M.A.
Law Enforcement
Shrewsbury Jr. High School
- Joseph M. Jordan, M.P.A.
Law Enforcement
Police Commissioner
- Francis J. Joyce, B.S.
Law Enforcement
District Attorney's Office
- Joseph A. Kaczenas, B.S.
Information Systems
Keane Associates

- Martin J. Kahan, B.S.
Information Systems
I.M.C. Chemical Group, Inc.
- Eugenia O. Kaledin, Ph.D.*
English
Northeastern University
- Edward L. Kandib, M.Ed.*
Accounting
U.S. Treasury
- Donald E. Kane, B.S.
Law Enforcement
Barnstable Police Dept.
- Martin J. Kane, M.B.A.*
Purchasing
Raytheon Co.
- Patricia F. Kannon, B.S.
Marketing
Self-Employed
- Charles J. Kantor, M.B.A.
Marketing
The Gillette Company
- Mort S. Kaplan, M.A.*
Drama/Speech
Northeastern University
- Deborah D. Kaplan, B.S.
Health Professions
Forsyth Institute for Rsrch.
- Gary M. Karelis, M.B.A.
Accounting
M. Karelis Wood Heel Co.
- Charles Karis, Ph.D.
Psychology
Northeastern University
- Harold D. Kastle, M.A.*
Personnel Relations
Raytheon Co.
- Stanley W. Kaszanek, Jr., M.A.
Anthropology/Sociology
Suffolk University
- Stephen R. Katz, Esq., J.D.
Political Science
Stpn. R. Katz, Esq., Attorney at Law
- Ronald P. Kaufman, B.S.
Law Enforcement
Mass. Dept. of Public Safety
- Robert C. Kazarian, M.A.
Economics
Northeastern University
- Helen Keaney, M.A.*
Music
Northeastern University
- Walter E. Kearney, M.B.A.*
Accounting
Northeastern University
- John S. Kearns, M.S.
Psychology
Northeastern University
- Hee Sung Keel, M.A.
Philosophy/Religion
- William E. Kelley, M.B.A.*
Accounting
Mass. Inst. of Technology
- Thomas W. Kelly, M.B.A.
Information Systems
Mass. General Hospital
- Solomon Kenea, M.A.
Economics
Northeastern University
- Raymond C. Kennedy, B.A.
Anthropology/Sociology
- Edward J. Kechan, LL.B.
Accounting
American Science & Eng. Inc.
- Paul G. Keough, M.P.A.
Political Science
U. S. Environmental Prot. Agency
- James J. Kerasiotes, B.A.
Political Science
Northeastern University
- Rostron J. Kershaw, M.S.
Therapeutic Recreation
Northeastern University
- A. David Kessler, Esq., J.D.
Accounting
Self-Employed
- Mary Ellen Kiddle, M.A.
Modern Languages
Self-Employed
- John H. Kimball, Jr., J.D.
Real Estate
Kimball & Kimball
- Brian L. King, M.B.A.
Marketing
Self-Employed
- Philip J. King, M.A.
Health Professions
Mt. Auburn Hospital
- Sandra J. King, B.S.
Information Systems
Data General
- Gary F. Kinsella, M.A.
Political Science
Northeastern University
- Paul G. Kinsella, B.S.*
Real Estate
Investors Mortgage Ins. Co.
- Claire E. Knox, M.S.
English
Chamberlain School of Retailing
- John L. Kobrick, Ph.D.*
Psychology
U.S. Army Rsch. Inst. Envir. Med.
- Bernhard J. Kohler, M.B.A.
Industrial Management
Polaroid Corporation
- Walter E. Kohler, B.S.
Industrial Management
Fireman's Fund Amer. Ins. Co.
- Arthur J. Komar, Ph.D.
Music
Northeastern University
- Holly C. Kooris, M.S.
Therapeutic Recreation
Northeastern University
- Elizabeth A. Kormas, B.A.
Biology
Northeastern University
- Harvey B. Korotkin, M.B.A.
Management Sciences
Polaroid
- Bennett L. Kramer, M.B.A.
Information Systems
Massasoit Community College
- Donald J. Kramer, M.B.A.*
Finance
Modicon Corp.
- Joseph A. Krasowski, M.S.
Chemistry
Northeastern University
- Ernest A. Kraus, M.S.W.
Therapeutic Recreation
Ernest A. Kraus Private Cons.
- David H. Kravetz, J.D.*
Law
Widett, Widett, Slater & Gol.

- Jane M. Kretchman, B.S.
Medical Technology
Northeastern University
- Donald F. Krier, Ph.D.*
Economics
Framingham State College
- LaVerne J. Kuhnke, Ph.D.
History
Northeastern University
- Robert A. Lafrance, Jr., B.A.
Biology
Northeastern University
- Paul K. Lambert, M.B.A.*
Transportation
Self-Employed
- Selma H. Lamkin, B.S.
Accounting
Self-Employed
- Stephen Lancey, Ph.D.
Psychology
Braintree Hospital
- Nelson P. Lande, M.A.
Philosophy/Religion
Northeastern University
- Robert H. Landry, M.B.A.*
Accounting
Massasoit Community College
- Harlan L. Lane, Ph.D.
Psychology
Northeastern University
- Philip J. Lane, M.A.
Economics
Tufts University
- Janet D. Lapey, M.D.
Cytotechnology
New England Deaconess Hosptl.
- Clifford R. Larson, M.B.A.
Finance
C. R. Larson Insurance Agency
- R. J. M. Lavizzo-Mourey, M.A.
Anthropology/Sociology
Boston College
- Gerard J. Lavoie, B.S.
Law Enforcement
Northeastern University
- Kenneth Lavoie, B.S.
Information Systems
Honeywell
- Joseph Laznow, M.S.
Earth Science
Yankee Atomic Electric Co.
- Alfred Lazzeri, M.F.A.
Art
School Dept.
- Edward J. Leach, J.D.
Law Enforcement
Revere Police Department
- Morris G. Learner, LL.B.
Insurance
- Stewart L. Lebo, M.S.
Information Systems
New England Telephone
- Frank F. Lee, Ph.D.
Anthropology/Sociology
Northeastern University
- Patricia A. Lee, B.A.
Medical Technology
Children's Hospital
- Susan E. Lee, M.S.
Drama/Speech
Mass. Bay Community College
- Roger J. F. Lehrberg, J.D.
Real Estate
Goldstein & Winnick
- Lila Leibowitz, Ph.D.
Anthropology/Sociology
Northeastern University
- Leonard L. Leinonen, M.S.
Industrial Management
Polaroid Corp.
- Bernard J. Lemire, B.S.
Chemistry
Northeastern University
- Ralph T. Lepore, Jr., B.S.
Law Enforcement
Truro Police Department
- Marvin X. Lesser, Ph.D.
English
Northeastern University
- Joseph E. Levangie, M.B.A.
Marketing
Sperry Rand
- Albert M. Levenson, M.B.A.*
Management Sciences
C.S. Draper Laboratory Inc.
- Dale F. Levering, Jr., Ph.D.
Biology
Northeastern University
- Evelyn D. Levin, M.B.A.
Political Science
Cape Cod Development Commn.
- Jack Levin, Ph.D.
Anthropology/Sociology
Northeastern University
- Sharon G. Levine, M.A.
Anthropology/Sociology
- Ellen S. Liberman, M.S.
Biology
Forsyth Dental Institute
- Robert C. Lieb, D.B.A.
Transportation
Northeastern University
- Kenneth E. Lindauer, Esq., J.D.
Political Science
Dr. Kenneth E. Lindauer, Esq.
- Joanne G. Linowes, M.S.
Drama/Speech
Mass. Educational Television
- Louis Lippiello, Ph.D.
Chemistry
Mass. General Hospital
- Robert L. Litrownik, Ph.D.
Psychology
Taunton State Hospital
- Marcia M. Littlefield, M.A.
Drama/Speech
Northeastern University
- Thomas E. Littlehale, M.B.A.
Information Systems
John Hancock Life Ins.
- Leo Litwin, M.A.
Music
Leo Litwin Piano Studios
- George M. Livingstone, Jr., A.S.
Leo Litwin Piano Studios
- Margaret A. Lloyd, Ph.D.
Psychology
Suffolk University
- J. Anthony Lloyd, M.A.*
English
Mass. Eye and Ear Infirmary
- Joseph S. Locastro, Ph.D.
Psychology
Boston V.A. Hospital

- John S. Locke, B.S.
Chemistry
Northeastern University
- Bruce M. Logan, Ph.D.
Political Science
MIT-Barker Eng. Library
- Richard C. Logan, B.A.
Medical Record Administration
The Memorial Hospital
- Edward J. Lonczak, M.B.A.
Management
Commercial Union Assurance
- Bertram S. Long, M.S.
- Donald W. Lovejoy, Ph.D.
Earth Science
Bentley College
- Miller C. Lovett, Ph.D.
Management
Boston State College
- Hope E. Luder, M.A.
History
Burlington High School
- John J. Lyons, M.A.
Law Enforcement
Retired
- Paul E. Lyons, B.S.*
Industrial Management
Gillette Company
- Robert L. Mabardy, M.B.A.
Personnel Relations
J.F. White Construction Co.
- Andrew C. Macaulay, M.S.*
Chemistry
N.E. Medical Ctr. Hospital
- Thomas J. MacDonough, M.A.
History
Town of Norwood
- Sylvia A. MacPhee, M.S.
Anthropology/Sociology
- Edward R. McCormack, M.P.A.
Law Enforcement
Boston Edison Co.
- Alan A. Mackey, A.M.
Law Enforcement
Northeastern University
- Lloyd J. MacKillop, B.S.
Purchasing
M.B. Claff
- Charles M. MacLean, M.S.
Law Enforcement
Natick Police Dept.
- George A. Macrina, M.S.
Industrial Management
Polaroid Corp.
- William J. Madden, A.B.*
Accounting
Office of Naval Research
- Stephen A. Madison, M.A.
Chemistry
Northeastern University
- Anne M. Magee, B.S.
Reading
Northeastern University
- Judith P. Magidson, M.Ed.
Reading
Y.M.C.A.
- Ann Marie Maguire, Esq., J.D.
Health Professions
Commonwealth of Mass.
- Gerard E. Maguire, M.B.A.
Purchasing
R.C.A. Corp.
- John A. Maguire, B.S.
Information Systems
University Hospital
- Thomas J. Maguire, LL.B.
Law Enforcement
Woburn Police Department
- Paul F. Mahoney, J.D.
Law Enforcement
Attorney Mahoney's Office
- Robert A. Maibor, M.B.A.
Accounting
First Natl. Bank of Boston
- Robert E. Mairs, B.S.
Personnel Relations
Revere Sugar Refinery
- Robert G. Mallion, M.Ed.
Earth Science
Stoneham Public Schools
- Nancy J. Mandell, M.A.
Anthropology/Sociology
Northeastern University
- George J. Manikas, B.S.E.E.
Law Enforcement
Raytheon Company
- Bernard Manning, LL.B.
Law Enforcement
Dept. of Attorney General
- John P. Manning, B.S.
Law Enforcement
Honeywell Info. Systems Inc.
- Albert R. Manson, M.Ed.*
Information Systems
Honeywell Info. Systems Inc.
- Jack J. Manuel, Ph.D.
Philosophy/Religion
Creative Humanistics Inc.
- John A. Manzo, Jr., M.S.
Industrial Management
N.E. Medical Ctr. Hospital
- Nell Margolis, J.D.
Finance
New. Eng. Mutual Life Ins. Co.
- Julius Mariasis, M.Ed.*
Management
Astamar, Inc.
- William T. Marler, B.S.
Law Enforcement
Lynn Police Department
- Michael Marlow, B.A.
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Northeastern University
- Arnold M. Marrow, Esq., LL.B.
Personnel Relations
Natl. Labor Relations Board
- Barbara Martin, A.B.
Medical Technology
Northeastern University
- James J. Martin, M.P.A.
Law Enforcement
Mass. State Police
- John A. Martin, M.B.A.
Accounting
Northeastern University
- John F. Martin, M.S.
Industrial Management
John F. Martin Assoc.
- John J. Martin, B.S.
Personnel Relations
Fed. Mediation & Council Serv.
- Leo J. Martin, B.S.
Law Enforcement
General Service Admin.

- Zareh Martin, M.Ed.*
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 Department of Education
- Frederick J. Mason, Jr., B.S.*
Accounting
 Internal Revenue Service
- Richard P. Mason, M.B.A.
Information Systems
 Avco Corp.
- Russell B. Mason, M.B.A.*
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 Raytheon Co.
- Burton N. Matross, M.B.A.
Accounting
 General Electric
- George D. Matson, M.A.*
Drama/Speech
 WMUR TV
- Paul F. Matthews, B.S.
Law Enforcement
 Mass. State Police
- Suenje Matthiesen, M.S.W.
Therapeutic Recreation
 Children's Hospital Med. Ctr.
- Kevin E. Mautte, M.S.
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 Northeastern University
- Paul D. Maxwell, M.B.A.*
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 Northeastern University
- Cynthia Mayher, M.S.
Health Professions
 Sharon Board of Public Health
- Teresa A. Mayors, B.A.
Anthropology/Sociology
 Northeastern University
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 Woburn Police Department
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Northeastern University
 Attorney McAuliffe
- Robert P. McAuliffe, M.B.A.*
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 Genrad, Inc.
- Daniel J. McCarthy, D.B.A.
Management
 Northeastern University
- William S. McCarthy, J.D.
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 Claims Bureau
- John E. McCormack, M.B.A.
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 Youville Hospital Inc.
- Joseph F. McCormack, M.Ed.*
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 Human Relations, Youth Resources
 Commission
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 Bentley College
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Law Enforcement
 Massachusetts State Police
- Andrew J. McDonough, B.S.*
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 Appleby & Wyman Inc.
- Daniel W. McElaney, Jr., M.A.
Marketing
- Earl E. McEvoy, M.B.A.
Finance
 Thorndike, Doran, Paine & Lewis
- David A. McGaughy, M.B.A.
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 Ark-Less Switch Corp.
- John B. McGrath, B.S.*
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 N.E. Telephone & Telegraph
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 E.G. & G. Inc.
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 John Hancock Mutual Life Insurance
- Leonard F. McNally, B.A.
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- Thomas J. McNamara, B.S.
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 Honeywell Info. Systems
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 Northeastern University
- Sheila G. McNeil, M.Ed.
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 Northeastern University
- Joseph P. McParland, J.D.
Law Enforcement
 Attorney McParland
- Daniel G. McSweeney, J.D.
Law Enforcement
 Lynn Police Dept.
- Paul J. McTague, J.D.
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 U.S. Department of Labor
- Herbert L. Meiselman, Ph.D.
Psychology
 U.S. Army Natick Labs
- Frank D. Mele, B.S.
Accounting
 Internal Revenue Service
- Craig N. Melin, M.B.A.
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 Beth Israel Hospital
- Bruce A. Mellin, M.S.
Earth Science
 Town of Chelmsford
- Arnold R. Meltzer, Esq., M.B.A.
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 Basic Marketing Services
- Deirdre C. Menoyo, M.A.
English
- Kenneth C. Mermer, B.S.
Health Professions
 Nevins Home Inc.

- George B. Merry, A.B.
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Christian Sci. Publ. Society
- Charles A.M. Meszoely, Ph.D.
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Northeastern University
- Michael W. Metzler, M.A.
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Stop & Shop Companies, Inc.
- Elmer B. Michelson, M.A.*
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Boston Conservatory of Music
- Stephen R. Miller, M.S.
Library Science
Wellesley Free Library
- Helena C. Minton, M.F.A.
English
Cambridge School
- Richard R. Miranda, M.B.A.
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State Street Bank & Trust Co.
- James R. Mitchell, Esq., M.A.
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Northeastern University
- James F. Molloy, Jr., M.B.A.*
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Tramco Inc.
- Leslie B. Morash, M.B.A.*
Transportation
Service Warehouse Co.
- Norman R. Moray, Jr., LL.B.*
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Hartford Ins. Group
- Jerry A. Morris, M.B.A.*
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Itek Corporation
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Audit Consultation & Trng.
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Therapeutic Recreation
Northeastern University
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Personnel Relations
American Mgmt. Associations
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Psychology
- Kent J. Mottle, B.S.
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Northeastern University
- James D. Mukjian, M.B.A.
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L.E. Muran Co.
- Bruce L. Muldoon, M.S.
Earth Science
Town of Wellesley
- James W. Mulford, B.S.
Law Enforcement
First Dist. Ct. of N. Middlesex
- Paul V. Mulkern, M.S.*
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U.S. Dept. of Labor
- Edmund J. Mullen, M.Ed.
Law Enforcement
Northeastern University
- Francis E. Mullen, B.S.
Law Enforcement
Quincy Police Dept.
- William S. Mullen, M.A.
Political Science
Foxboro School System
- Bianca M. Murphy, C.A.G.S.
Psychology
Womanspace Fem. Therapy Coll.
- Charles W. Murphy, M.B.A.
Finance
Bunker Hill Comm. College
- James F. Murphy, B.S.
Law Enforcement
Haverhill Police Dept.
- Paul J. Murphy, M.B.A.*
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General Electric Company
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Northeastern University
- Robert P. Najjar, M.B.A.*
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Northeastern University
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Purchasing
AVCO
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Kabatznick Stern & Copper
- Mark A. Nathanson, Ph.D.
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Harvard Medical School
- Theodore H. Needle, B.S.*
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Needle & Needle
- Paul A. Neeson, B.A.
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Fred S. James & Co. Inc.
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Marketing
York Division-Borg Warner
- David C. Nelson, B.S.
Accounting
David C. Nelson
- Graham J. Nelson, A.B.
Finance
Connecticut Mutual Life Insurance
- Margaret W. Nelson, M.A.
English
- John N. Nestor, J.D.
Law Enforcement
Attorney
- Paula A. Newcomb, M.S.
Therapeutic Recreation
Northeastern University
- Thomas J. Neylon, Jr., M.A.
English
Watertown Public Schools
- Bruce E. Nickerson, Ph.D.*
Anthropology/Sociology
Contract Research Corp.
- James S. Nicolson, M.A.
Music
Northeastern University
- Alicia K. Nitecki, Ph.D.
English
- Donald C. Norris, Ph.D.
Philosophy/Religion
Harvey Industries Inc.
- Richard W. Norton, B.A.*
Information Systems
The Foxboro Company
- Nancy V. Nowak, B.S.
Psychology
Northeastern University

- Edward G. Novello, B.S.*
Transportation
Advent Corporation
- Robert F. Nunes, M.A.
English
Mass. Bay Community College
- Ellen G. O'Brien, M.Ed.
Law Enforcement
Northeastern University
- David H. O'Brien, M.B.A.
Accounting
N.E. Merchants Bank
- John J. O'Brien, B.A.
Insurance
Continental Insurance Co.
- Paul D. O'Brien, LL.B.
Law Enforcement
General Electric Co.
- Robert B. O'Brien, M.B.A.
Accounting
The Kennedy Center
- Robert M. O'Brien, B.S.*
Information Systems
Northeastern University
- William T. O'Brien, M.A.
Law Enforcement
Boston Police Dept.
- John J. O'Callaghan, LL.M.
Law Enforcement
Suffolk University
- Daniel F. O'Connor, M.S.
Information Systems
Northeastern University
- Edward T. O'Donnell, M.B.A.
Economics
Retired
- John J. O'Donnell, M.B.A.
Information Systems
Massachusetts Gen. Hospital
- Aileen J. Ofer, M.A.
English
- Kay B. O'Laughlin, M.Ed.
Reading
Boston University
- Harry Olins, Esq., J.D.*
Law
Self-Employed
- Ernest Oliveira, Jr., M.B.A.
Industrial Management
General Electric
- Wayne J. Oliver, M.A.
Economics
Northeastern University
- Gerald F. Olsen, M.B.A.
Accounting
Raytheon Company
- George C. Olson, M.B.A.
Information Systems
Home Savings Bank
- David S. Omar, M.Ed.*
Economics
Dean Junior College
- James W. O'Neil, A.B.
Law Enforcement
James W. O'Neil, Inc.
- John P. O'Neill, M.B.A.
Law Enforcement
Sanders Associates, Inc.
- Marc P. Onigman, M.A.
History
Northeastern University
- George J. Oshea, Jr., M.S.W.
Law Enforcement
Div. of Youth Service
- Richard H. Oshea, M.P.A.
Law Enforcement
Mass. State Police
- Lawrence Osterweil, B.A.
Health Professions
Prospect Nursing Home Corp.
- Albert J. Ottariano, M.B.A.*
Economics
U.S. Dept. of Labor
- J. Rosson Overcash, M.A.
Earth Science
Bunker Hill Community College
- Carol A. Owen, Ph.D.
Anthropology/Sociology
Northeastern University
- Edward A. Pacyna, Jr., M.B.A.
Marketing
Digital Equip. Corp.
- Richard W. Paine, Ph.D.
Psychology
- Michael S. Paisner, J.D.
Purchasing
M.S. Paisner, Inc.
- Alice T. Paley, M.Ed.
Psychology
Lesley College
- Howard R. Palmer, LL.B.*
Law Enforcement
Attorney General's Office
- Leo Panas, M.S.*
Art
Lowell State College
- Judith M. Pariseau, B.S.
Biology
Northeastern University
- Beverly Parry, M.Ed.
Therapeutic Recreation
Hogan Regional Center
- Robert A. Parsons, M.A.*
Management Sciences
Northeastern University
- Paul S. Paslaski, M.B.A.
Information Systems
Harvard University
- Bernard R. Patriacca, Jr., M.B.A.
Accounting
Dunkin Donuts Inc.
- Theodore C. Patrikas, B.S.*
Management
General Electric Co.
- David F. Pauling, M.A.
General Electric Co.
Northeastern University
- Joseph V. Pearincott, Ph.D.*
Biology
Northeastern University
- Joseph C. Pedula, B.S.
Personnel Relations
Gillette Co.
- Martin L. Pendleton, Jr., B.S.*
Information Systems
Independent Consultant
- Philip W. Pendleton, Ph.D.
Psychology
Northeastern University
- Carroll E. Pennell II, M.B.A.
Real Estate
N.E. Merchant's Natl. Bank

- Rohe V. Pennington V., B.A.
Psychology
Northeastern University
- Francine L. Pennino, B.S.
Real Estate
Kuras & Co., Inc.
- William A. Percy, Ph.D.
History
Univ. of Mass. Boston Campus
- Philip P. Perry, M.A.
Law Enforcement
Filene's Dept. Store
- Daniel Pershonok, Ph.D.*
Psychology
Harvard Medical School
- Lucretia Peteros, M.S.
Anthropology/Sociology
Graham Jr. College
- Frederick D. Peterson, M.A.
Anthropology/Sociology
Merrimack College
- Ausrele M. Petronis, M.A.
English
- Robert G. Phelan, LL.B.
Law Enforcement
Phelan & Phelan, Attorneys
- Marie J. Philip, B.A.
Psychology
Northeastern University
- James J. Phillips, Ph.D.
Anthropology/Sociology
Amer. Friends Service Comm.
- George G. Pierce, J.D.*
Law
U.S. Government Dept. of Hearings & Appeals
- Benjamin E. Pike, M.B.A.*
Personnel Relations
Massasoit Community College
- Gerald T. Pineault, M.B.A.
Industrial Management
Polaroid Corp.
- Garth I. Pitman, M.A.
English
Northeastern University
- Carmen S. Pizzuto, Ph.D.*
Law Enforcement
Div. of Youth Service
- Gladys M. Polansky, M.A.
English
- Michael A. Porges, M.B.A.
Finance
The Gillette Company
- James Port, B.S.
Law Enforcement
Massachusetts State Police
- John D. Post, Ph.D.*
History
Northeastern University
- James E. Poulos, M.A.
English
Newbury Jr. College
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Self-Employed
- William J. Powers, M.P.A.
Law Enforcement
First Security Corp.
- John T. Prendergast, LL. B.
Law Enforcement
Dept. of Public Safety
- Lyndon B. Preston, Ph.D.
English
Northeastern University
- Edward V. Puopolo, J.D.*
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Biology
Metcalf and Eddy
- Allan L. Raisman, B.A.
Biology
Bioran Medical Labs
- Jonathan E. Rakin, B.S.
Economics
Northeastern University
- Daniel Rakov, Esq., J.D.
Real Estate
Rappaport & Rakov
- Robert W. Ramage, Jr., M.B.A.
Finance
First Natl. Bank of Boston
- Malati Ramratnam, Ph.D.
English
- Lewis M. Randa, B.S.
Therapeutic Recreation
Life Experience School
- Denise Ratliff, B.S.
Therapeutic Recreation
Northeastern University
- Nathaniel C. Raymond, Ph.D.*
Anthropology/Sociology
Boston State College
- James H. Reeves, B.A.
Chemistry
Northeastern University
- Denis G. Regan, Esq., J.D.*
Law
Self-Employed
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Law Enforcement
Mass. Organiz. Crime Control
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Law Enforcement
Dept. of Public Safety
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State Street Bank & Trust
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Northern Essex Comm. College
- Philip J. Reilly, Jr., B.S.
Law Enforcement
Dept. of Public Safety
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Northeastern University
- Frank C. Renew, Jr., M.A.
Psychology
Northeastern University
- Alice E. Richmond, J.D.
Law Enforcement
N.E. School of Law
- Herbert L. Richmond, C.A.G.S.
Therapeutic Recreation
Area II Homecare Senior Ct.
- Martha A. Richmond, M.Ed.
Therapeutic Recreation
- Frederick W. Riley, J.D.
Law Enforcement
Fogarty & Bongiorno
- J. Scott Riley, B.S.
Marketing
J.S.R. Associates Inc.
- Frank M. Robinson, Jr., M.S.
Therapeutic Recreation
Northeastern University

- Nelson Buck Robinson, J.D.
Industrial Management
Essex County Ecology Ctr. Inc.
- Raymond H. Robinson, Ph.D.
History
Northeastern University
- Leo F. Roche, Jr., LL.B.
Finance
Darling & McLaughlin
- John L. Roebber, Ph.D.
Chemistry
Northeastern University
- B. Susan Rogers, M.S.
Medical Technology
Northeastern University
- Cephas B. Rogers, M.B.A.*
Industrial Management
Polaroid Corp.
- Ralph V. Rogers, B.A.
Anthropology/Sociology
Boston City Hall
- Theodore Role, M.A.
Personnel Relations
Theodore Role
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Theodore Role
Charles Stark Draper Lab. Inc.
- Robert N. Romanowski, B.S.
Law Enforcement
First Security Services Corp.
- Robert D. Ronsheim, M.A.*
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Biology
Northeastern University
- Morris E. Rosenberg, B.A.*
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Industrial Management
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Northeastern University
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Gillette Co.
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Retired
- Richard N. Roy, M.B.A.
Transportation
Stone & Webster Eng. Corp.
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Psychology
Northeastern University
- Cheryl Rubin, B.S.
Therapeutic Recreation
Mass. Rehab. Hospital
- Gerald R. Rubin, B.S.*
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Greene Rubin & Miller
- Richard V. Rude, B.A.
Greene Rubin & Miller
- Thomas J. Rudegear, Ph.D.
Biology
Self-Employed
- Louis Rudzinsky, B.S.
Personnel Relations
Louis Rudzinsky Assoc. Inc.
- Adrian Ruth, M.A.
Anthropology/Sociology
National Organization Women
- Edward F. Ryan, B.S.
Law Enforcement
Revere Police Department
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Stonehill College
- John D. Ryder, M.S.A.
Accounting
Howard Johnson Co.
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University of Lowell
- Carol Saffran, B.S.
Economics
Northeastern University
- Charles L. Sakey, M.A.*
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City of Boston
- George J. Salm, B.A.
Political Science
Northeastern University
- Mary E. Salus, M.A.
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Mass. Dept. Public Welfare
- Gary Sanford, Ph.D.
Biology
Wellesley College
- Willis L. Saulnier, M.S.W.*
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Raytheon Co.
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Price Waterhouse Co.
- Margaret Schenkman
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Lawrence Police Dept.
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Law Enforcement
Dept. of Youth Service
- Leonard A. Seder, M.B.A.*
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Leonard A. Seder Associates

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Boston College
- Peter M. Selig, M.A.*
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American Optical
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Bolt Beranek & Newman Inc.
- John W. Shank, M.S.
Therapeutic Recreation
Dr. Solomon Carter Fuller Mental Health Ctr.
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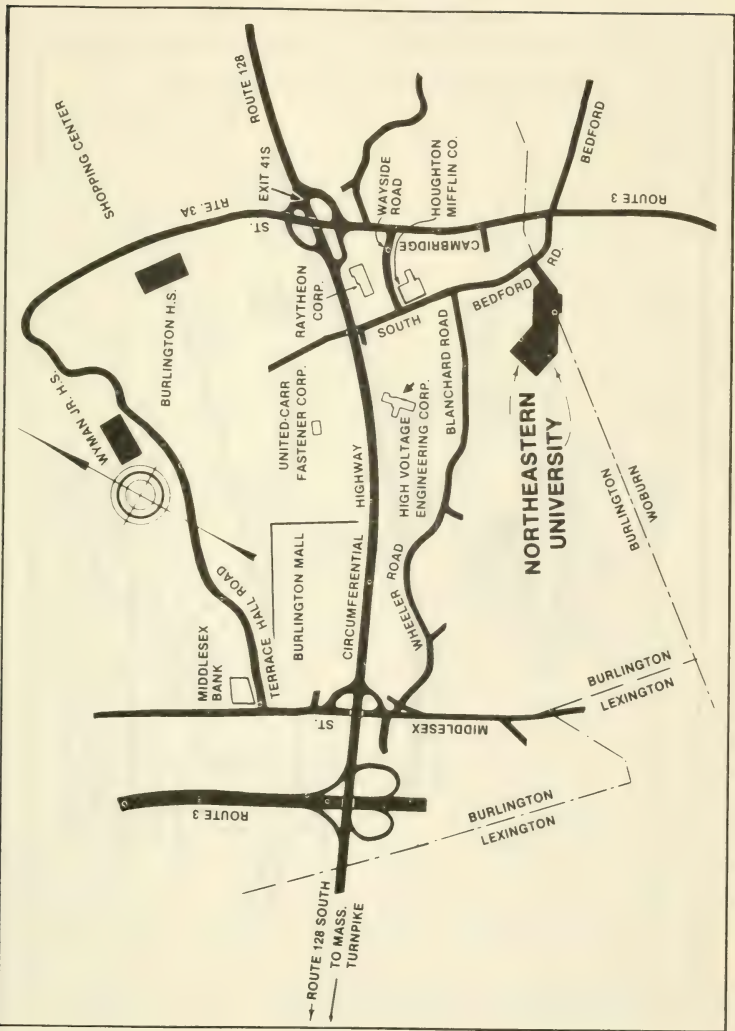
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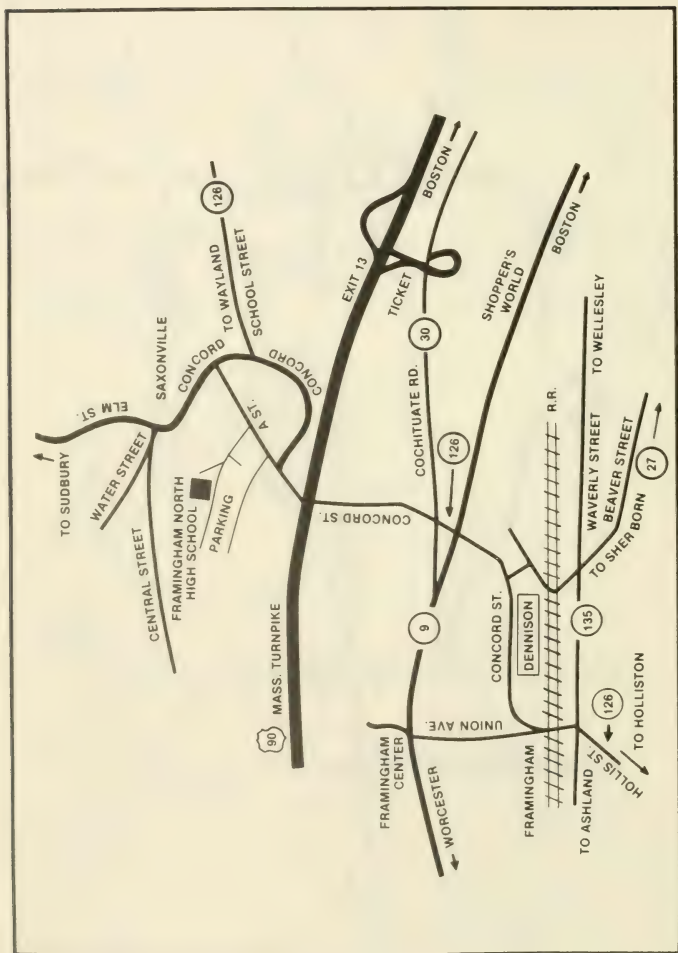
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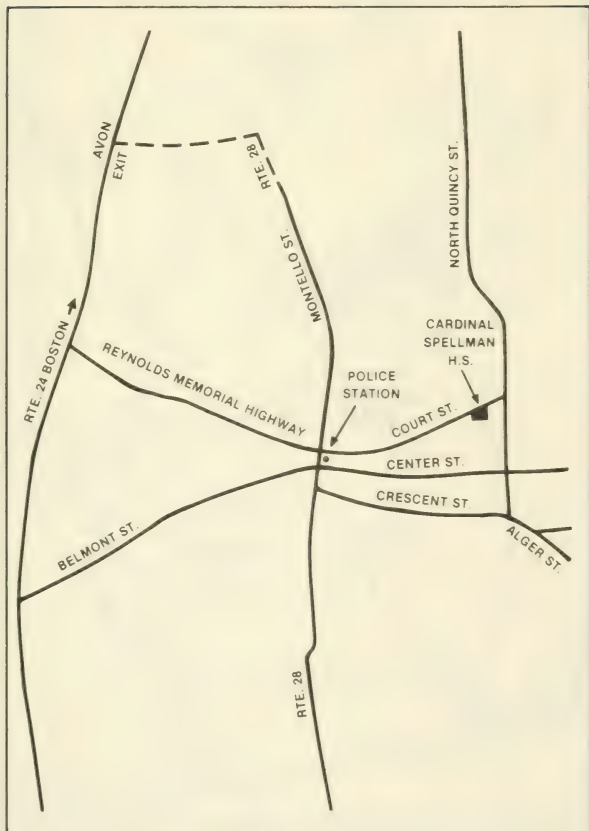
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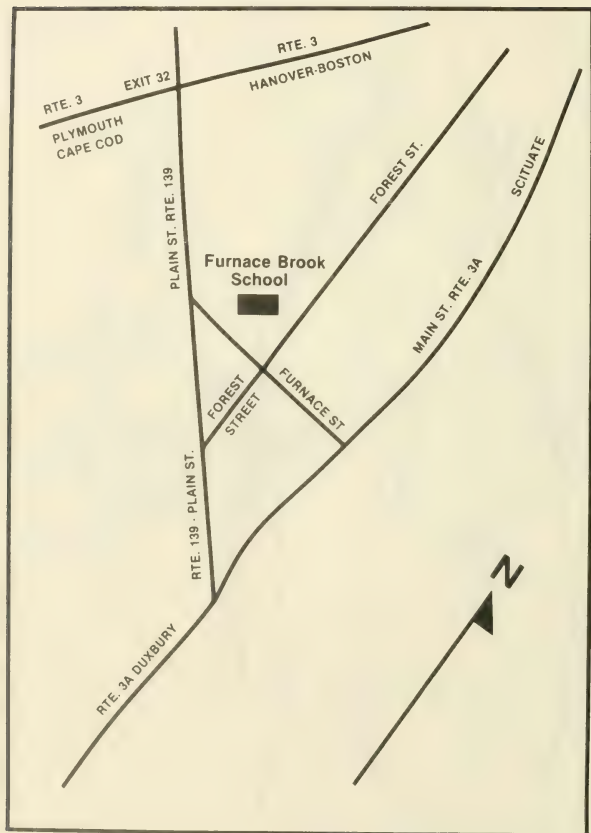
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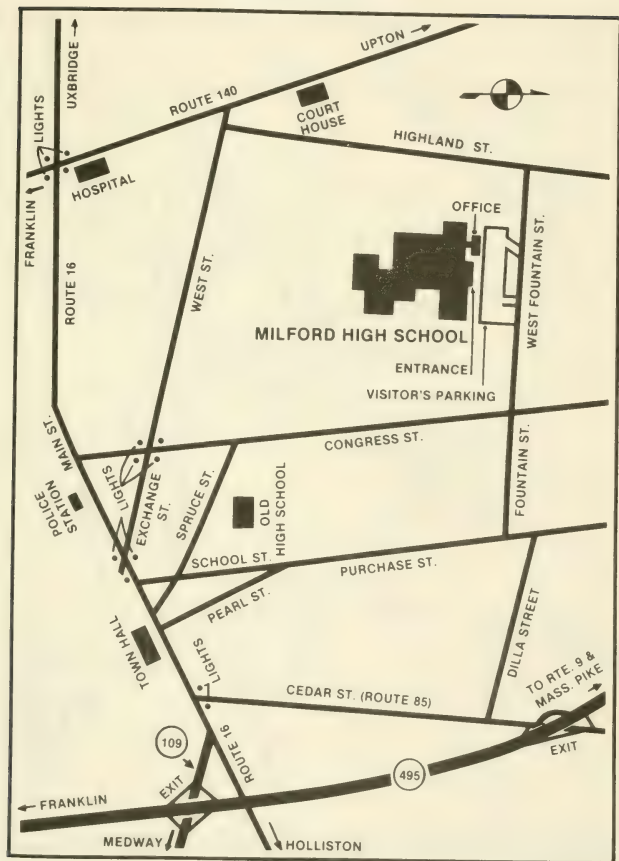
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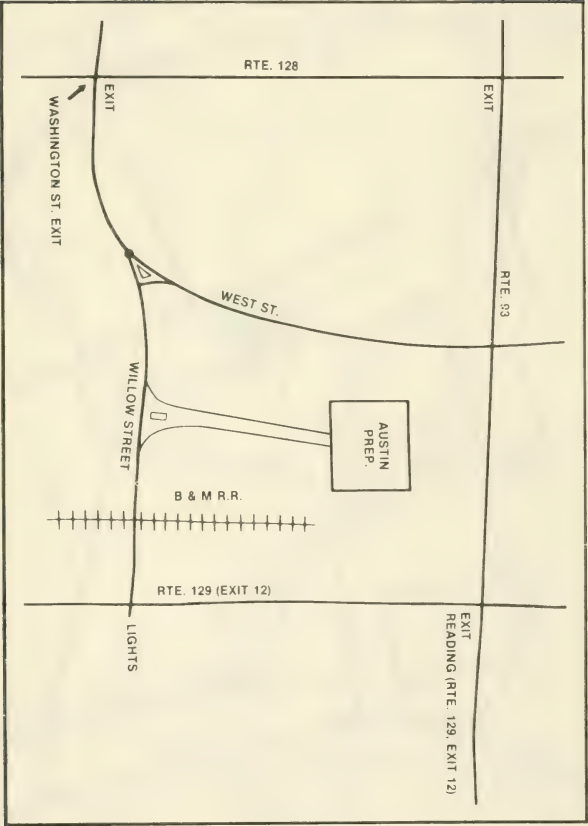
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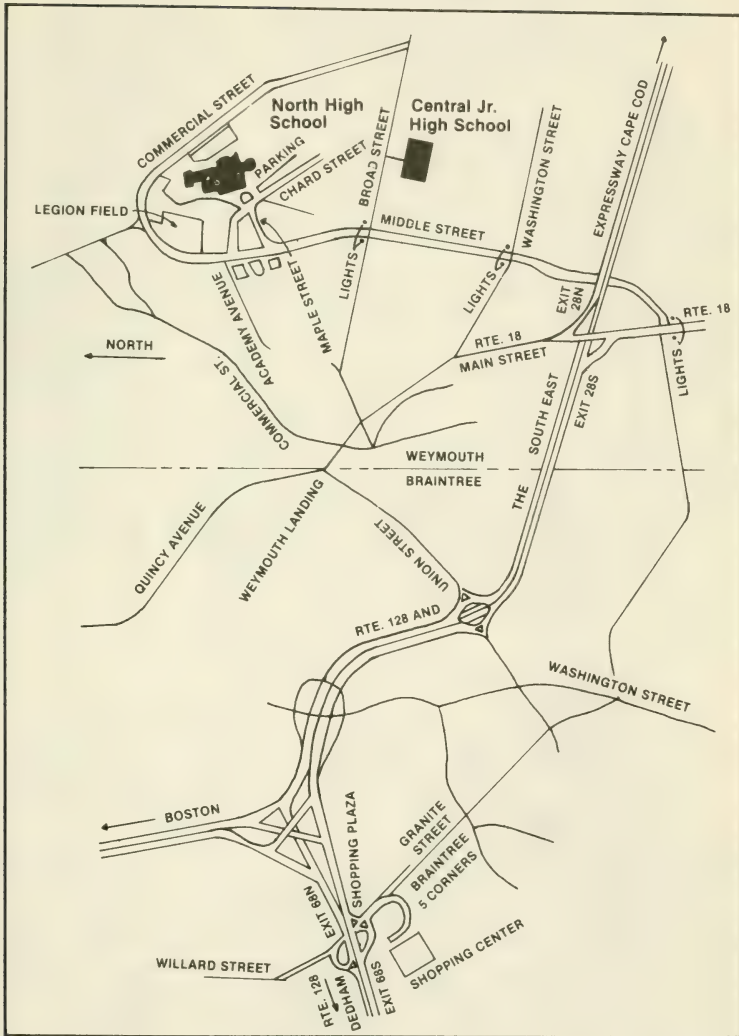
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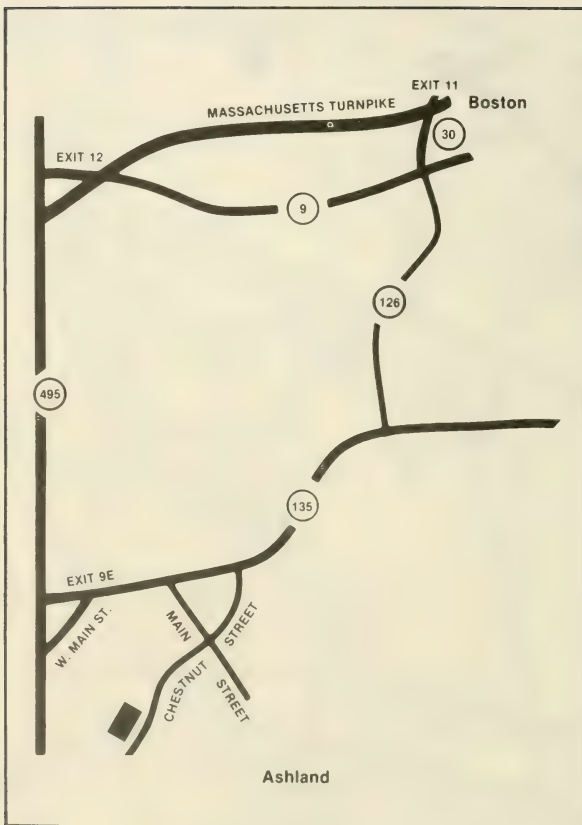
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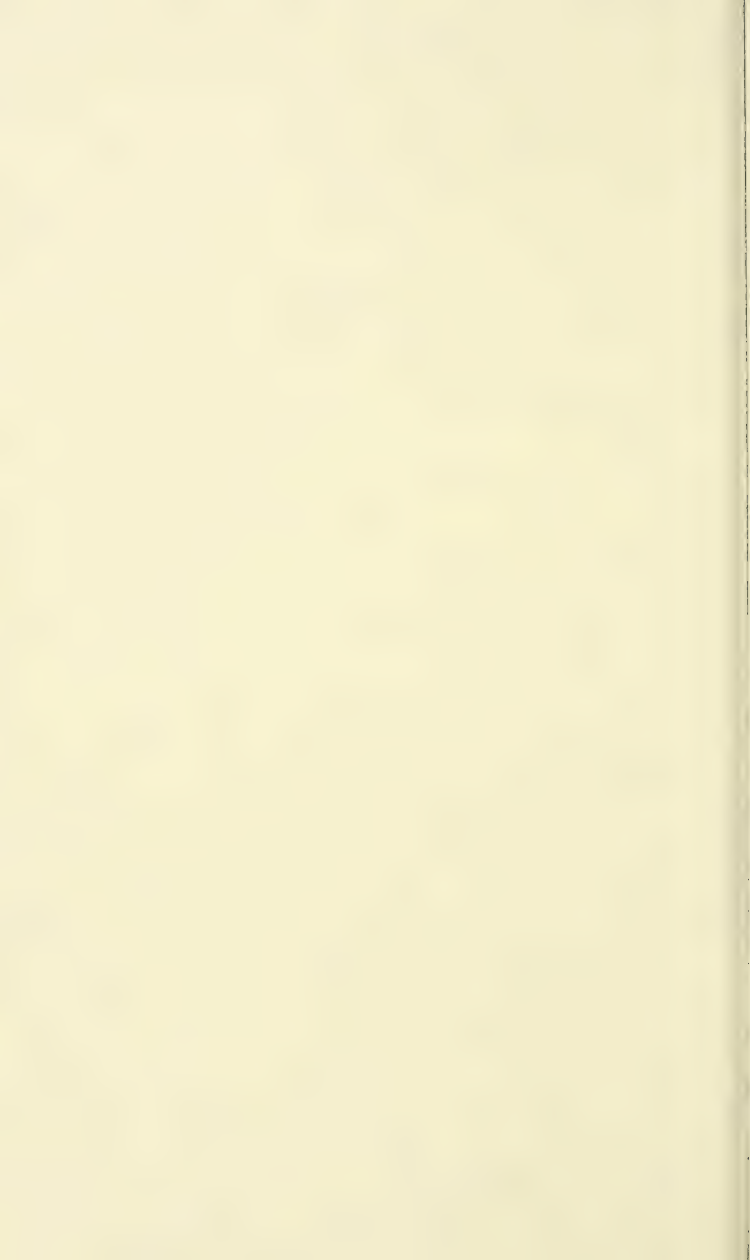
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